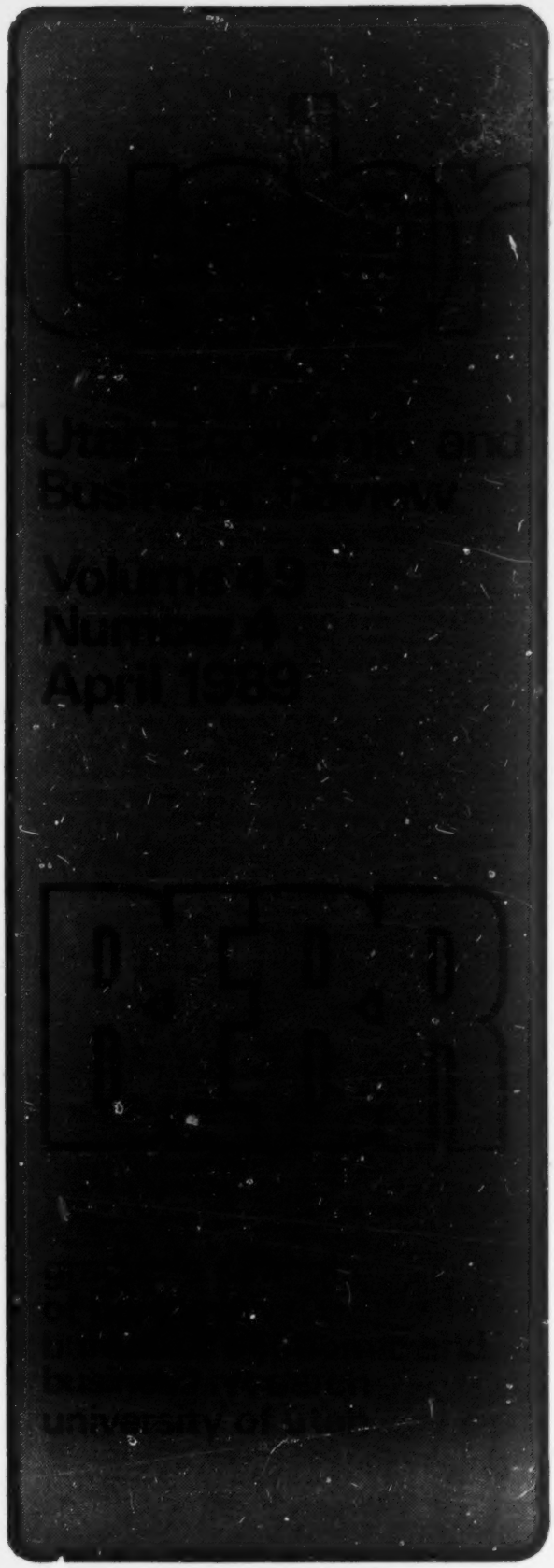
U8960-2 A



PERSONAL INCOME IN UTAH COUNTIES, 1987

Boyd L. Fjeldsted
Senior Research Economist

The Bureau of Economic and Business Research of the University of Utah has been designated by the United States Department of Commerce, Bureau of Economic Analysis to be a member of the BEA User Group. As such, the Bureau of Economic and Business Research annually receives unpublished BEA estimates of county personal income for the purpose of providing public dissemination of the information. The data in Table 1 have been obtained from the most recently released BEA county personal income estimates for the State of Utah.

Personal Income and Its Components

Personal Income is defined by the BEA to comprise the money value of current income received from all sources by, or on behalf of, persons residing in a given geographical area, including income received in both monetary and non-monetary forms. Specifically, personal income consists of:

- Wage and salary disbursements, excluding social security taxes and other personal contributions for social insurance paid by employees.
- Other labor income, which consists of employer contributions for private life and medical insurance, private retirement programs and other private "fringe" benefits.
- Net income of owners of unincorporated enterprises, excluding self-employed contributions for social security and other social insurance.
- Property income, including dividends, interest and rent.
- Transfer payments, i.e., personal payments by government or business for which no services are currently rendered.

Income derived from participation in the work force is referred to as *labor and proprietors' income* or *earnings* and includes (1) wage and salary disbursements, (2) other labor income and (3) net income of owners of unincorporated enterprises. *Net labor and proprietors' income* or *net earnings* is arrived at by deducting social security taxes and other social insurance contributions paid by workers, including self-employment contributions paid by owners of unincorporated enterprises.

Since wage and salary disbursements and other labor income are reported on a place-of-work basis, labor and proprietors' income must be adjusted for the effect of interarea commuting in order to arrive at the earnings component of personal income (which is defined on a place-of residence basis). This adjustment is accomplished by estimating the difference between the net earnings of persons who reside in a given area but who work in other areas, and the net earnings of persons who work in the given area but reside in other areas. This difference is referred to as the *residence adjustment*.

BEA Income Imputations

It should be noted that the BEA personal income estimates include imputations or allowances for the value of certain types of income realizations, even though no monetary transaction is involved. These include imputations for:

- wages and salaries paid in kind, i.e., in the form of food, clothing or lodging;
- rental value of owner occupied dwelling units;
- food and fuel produced and consumed on farms; and
- interest earned on money deposited with financial intermediaries for which no interest is actually paid or credited.

This last item includes, for example, an imputation for the interest earning potential of ordinary bank demand deposit accounts, even though banks do not ordinarily pay interest on such accounts. For the state as a whole, imputed interest amounts to roughly 35 percent of total interest, while imputed rent amounts to approximately 40 percent of total rent.

BEA Person Concept

It should be further noted that personal income as defined by the Bureau of Economic Analysis includes the income of certain legal entities not ordinarily regarded as "persons," including non-profit institutions serving individuals, private non-insured pension funds, health and welfare funds and private trust funds. In effect the current earnings of these organizations are credited directly to the ultimate beneficiaries for personal income accounting purposes. Since such organizations are considered to be persons, benefit payments by them to individuals are considered to be transfer payments among persons and not part of personal income. The undistributed earnings of life insurance carriers and private non-insured pension funds are also credited to persons for personal income accounting purposes.

County Income by Type and Industry

Table 1 presents the most recent Bureau of Economic Analysis county estimates of personal income broken down by type, and earnings broken down by industrial source. It should be stressed that personal income is presented on a place-of-residence basis, i.e., credited to the area of the recipient's residence, while labor and proprietors' income (earnings) is presented on a place-of-work basis, i.e., credited to the area in which the earning activity takes place.

Table 1 also reveals the industrial structure of income generation in Utah and its 29 counties. Somewhat surprising, perhaps, is the fact that in only five counties does farming account for more than 15 percent of total earnings. These five counties are Rich (with farming accounting for 47 percent of total earnings), Piute (40 percent), Beaver (22 percent), Morgan (17 percent), Sanpete (17 percent) and Wayne (17 percent). For the state as a whole, farming accounts for only about 1 percent of total earnings.

Those counties whose economies may be characterized as distinctly oriented toward mining (including oil and gas extraction) include Carbon (where the mining sector accounts for 36 percent of total earnings), Emery (36 percent), Uintah (19 percent) and San Juan (19 percent). Those counties whose economies have a distinctly manufacturing orientation include Box Elder (where manufacturing accounts for 70 percent of total earnings), Cache (28 percent), Morgan (22 percent) and Weber (20 percent).

There are two counties whose economies are dominated by the federal government: Tooele (where federal government accounts for 56 percent of total earnings) and Davis (41 percent). In Daggett the federal government accounts for 23 percent of total earnings; but in addition the state and local government sector accounts for 23 percent of total earnings—so that 46 percent of total earnings in Daggett comes from government employment.

There are only three counties for which property income and transfer payments account for 40 percent or more of total personal income. These are Piute (46 percent), Washington (43 percent) and Beaver (42 percent). The relatively high dependence of these counties on property income and transfer payments can be explained in part by the relatively high proportion of persons of retirement age in their populations. In 1980 Piute

County, for example, led the state with 17 percent of its population age 65 or over. Washington and Beaver Counties were not far behind, with 13 to 14 percent of their populations being age 65 or over (U.S. Department of Commerce, Bureau of the Census, 1980 Census Report PC80-1-B46, Table 44).

Growth Sectors and Growth Counties

For the state as a whole two major sectors showed substantial sustained growth in labor and proprietors' income over the five-year period 1982 through 1987: (1) finance, insurance and real estate, with a growth rate of 11 percent per annum and (2) services, also with a growth rate of 11 percent per annum. Though farming accounts for only about 1 percent of earnings in the State of Utah, the rate of growth in earnings in the farm sector actually exceeded that in finance, insurance and real estate and in services, with a five-year growth rate of 14 percent per annum. Two other sectors exhibited substantial rates of growth between 1982 and 1987: military, with a growth rate of 8 percent per annum and state and local government (7 percent per annum).

Those counties exhibiting growth rates during the five-year period that were substantially higher than the state average in the finance, insurance and real estate sector were Summit, with a growth rate of 26 percent per annum, Morgan (17 percent per annum) and Washington (13 percent per annum).

Those counties showing high sustained growth rates in the services sector were Daggett, with a growth rate of 24 percent per annum, Washington (17 percent per annum) and Wasatch (15 percent per annum).

Those counties experiencing rapid growth in the military sector were Weber, with a growth rate of 22 percent per annum, Millard (21 percent per annum) and Washington (18 percent per annum). However, between 1986 and 1987 military earnings in Weber County failed to increase.

Those counties exhibiting relatively rapid growth in state and local government earnings over the five-year period were Washington (with a growth rate of 13 percent per annum, Summit (11 percent) and Uintah (also 11 percent).

Four counties stood out in sustained relative growth in personal income over the five-year period: Washington recorded the highest, with a growth rate of 13 percent per annum, followed by Summit (10 percent per annum), Box Elder (9 percent per annum) and Wayne (8 percent per annum).

Per Capita Personal Income

Per capita personal income figures for Utah counties in 1987 are also shown in Table 1 (on the second line). Summit County had the highest per capita personal income at $15,906, followed by Weber ($12,622) Salt Lake ($12,567) and Box Elder ($12,506). A per capita personal income time series for the State of Utah from 1969 to 1988 is presented in Table 2. These data show that Utah's position advanced from 79 percent of the national average in 1969 to 83 percent of the national average by 1977, but has since slipped to only 73 percent of the national average. It should be noted that the estimates of per capita personal income in Table 2 are based on Bureau of the Census revised state population estimates, whereas the estimates of per capita personal income in Table 1 are based on estimates of county population that have not been revised to reflect the revision in the state population estimates. This accounts for the slight discrepancy between the estimated per capita personal income for the State of Utah as shown in Table 1 as compared to Table 2.

Table 2
Utah Per Capita Personal Income
1969-1988

Year	Amount (dollars)	Percent of U.S. Average	State Rank
1969	3,026	79	38
1970	3,297	81	38
1971	3,547	83	39
1972	3,861	83	39
1973	4,217	81	42
1974	4,613	82	42
1975	4,988	82	39
1976	5,513	83	39
1977	6,068	83	39
1978	6,766	83	40
1979	7,407	82	41
1980	7,952	80	45
1981	8,660	79	45
1982	9,041	79	45
1983	9,400	78	45
1984	10,120	77	46
1985	10,653	77	47
1986	10,988	75	48
1987	11,389	74	48
1988[P]	12,013	73	48

[P] preliminary

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	State of Utah			Beaver			Box Elder		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	19,129,330	100.0[a]	4.6	46,093	100.0[a]	3.6	475,961	100.0[a]	10.8
Per capita personal income (dollars)	11,386	73.6[b]	3.6	9,220	59.6[b]	3.5	12,506	80.8[b]	9.1
Derivation of total personal income:									
Total earnings by place of work	14,662,358	100.0[c]	4.1	27,625	100.0[c]	2.9	476,077	100.0[c]	14.7
Less: Contributions for social insurance	870,827	5.9[c]	3.5	1,485	5.4[c]	-4.7	27,636	5.8[c]	12.6
Plus: Residence adjustment	68,617	.5[c]	-9.7	617	2.2[c]	-1.2	-84,281	-17.7[c]	(U)
Equals: Net earnings by place of residence	13,860,148	72.5[a]	4.0	26,757	58.1[a]	3.3	364,160	76.5[a]	12.5
Plus: Dividends, interest, and rent	2,547,771	13.3[a]	4.8	8,839	19.2[a]	4.0	53,711	11.3[a]	4.3
Plus: Transfer payments	2,721,411	14.2[a]	7.6	10,497	22.8[a]	4.1	58,090	12.2[a]	6.8
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	12,081,334	82.4[c]	3.6	17,315	62.7[c]	-7.3	387,679	81.4[c]	13.6
Other labor income	1,079,974	7.4[c]	3.2	1,410	5.1[c]	-2.7	51,032	10.7[c]	14.9
Proprietors' income	1,501,050	10.2[c]	8.4	8,900	32.2[c]	32.8	37,366	7.8[c]	27.0
Farm	149,318	1.0[c]	37.8	4,941	17.9[c]	67.2	12,380	2.6[c]	112.6
Nonfarm	1,351,732	9.2[c]	5.9	3,959	14.3[c]	5.6	24,986	5.2[c]	5.9
Earnings by industry									
Farm	195,077	1.3[c]	27.7	6,062	21.9[c]	50.8	16,500	3.5[c]	67.7
Nonfarm	14,467,281	98.7[c]	3.8	21,563	78.1[c]	-5.4	459,577	96.5[c]	13.4
Private	11,357,502	77.5[c]	4.2	15,375	55.7[c]	-8.0	427,231	89.7[c]	14.1
Agricultural services and other	38,911	.3[c]	6.6	80	.3[c]	11.1	1,552	.3[c]	(U)
Mining	312,000	2.1[c]	2.0	(L)	(L)	(L)	276	.1[c]	(U)
Construction	955,273	6.5[c]	-8.5	1,498	5.4[c]	-37.1	18,920	4.0[c]	12.1
Manufacturing	2,402,757	16.4[c]	1.9	919	3.3[c]	139.3	333,295	70.0[c]	15.7
Nondurable goods	625,855	4.3[c]	7.8	(D)	(D)	(D)	2,601	.5[c]	55.4
Durable goods	1,776,902	12.1[c]	.0	(D)	(D)	(D)	330,694	69.5[c]	15.4
Transportation and public utilities	1,241,367	8.5[c]	3.7	5,144	18.6[c]	(U)	7,065	1.5[c]	3.9
Wholesale trade	887,513	6.1[c]	-1.6	259	.9[c]	-6.7	8,162	1.7[c]	.0
Retail trade	1,422,709	9.7[c]	2.7	3,108	11.3[c]	-1.2	24,330	5.1[c]	5.5
Finance, insurance, and real estate	819,441	5.6[c]	7.7	582	2.1[c]	1.9	4,720	1.0[c]	24.6
Services	3,277,531	22.4[c]	12.6	3,741	13.5[c]	(U)	28,911	6.1[c]	12.2
Government	3,109,779	21.2[c]	2.4	6,188	22.4[c]	1.3	32,346	6.8[c]	4.5
Federal civilian	1,053,205	7.2[c]	2.6	960	3.5[c]	-3.8	2,745	.6[c]	-1.2
Military	208,806	1.4[c]	4.4	210	.8[c]	10.5	1,629	.3[c]	5.9
State and local	1,847,768	12.6[c]	2.0	5,018	18.2[c]	2.0	27,972	5.9[c]	5.0

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Cache			Carbon			Daggett		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	667,912	100.0[a]	6.4	268,718	100.0[a]	2.1	8,940	100.0[a]	10.2
Per capita personal income (dollars)	10,181	65.8[b]	6.0	12,065	77.9[b]	3.3	10,444	67.5[b]	-3.4
Derivation of total personal income:									
Total earnings by place of work	455,963	100.0[a]	7.9	180,339	100.0[a]	-.1	5,581	100.0[a]	12.5
Less: Contributions for social insurance	26,185	5.7[c]	8.0	10,885	6.0[c]	-.4	299	5.4[c]	10.7
Plus: Residence adjustment	46,520	10.2[c]	-8.7	15,310	8.5[c]	13.4	1,456	26.1[c]	9.5
Equals: Net earnings by place of residence	476,298	71.3[a]	6.0	184,764	68.8[a]	.8	6,738	75.4[a]	11.9
Plus: Dividends, interest, and rent	95,314	14.3[a]	4.4	34,273	12.8[a]	4.7	954	10.7[a]	5.2
Plus: Transfer payments	96,300	14.4[a]	10.7	49,681	18.5[a]	5.5	1,248	14.0[a]	5.6
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	358,224	78.6[c]	7.5	145,856	80.9[c]	-.9	4,168	74.7[c]	11.1
Other labor income	35,878	7.9[c]	5.5	17,510	9.7[c]	-.3	378	6.8[c]	24.8
Proprietors' income	61,861	13.6[c]	11.6	16,973	9.4[c]	7.3	1,035	18.5[c]	14.1
Farm	10,755	2.4[c]	41.5	2,243	1.2[c]	15.1	227	4.1[c]	87.6
Nonfarm	51,106	11.2[c]	6.8	14,730	8.2[c]	6.3	808	14.5[c]	2.8
Earnings by industry									
Farm	15,058	3.3[c]	28.4	2,506	1.4[c]	13.1	292	5.2[c]	51.3
Nonfarm	440,905	96.7[c]	7.3	177,833	98.6[c]	-.2	5,289	94.8[c]	11.0
Private	318,240	69.8[c]	7.5	145,531	80.7[c]	-1.1	2,678	48.0[c]	21.3
Agricultural services and other	3,208	.7[c]	29.4	100	.1[c]	3.1	(D)	(D)	(D)
Mining	280	.1[c]	47.4	65,633	36.4[c]	2.0	(D)	(D)	(D)
Construction	35,678	7.8[c]	-5.1	7,709	4.3[c]	-14.8	257	4.6[c]	8.0
Manufacturing	125,835	27.6[c]	13.0	4,356	2.4[c]	2.4	(D)	(D)	(D)
Nondurable goods	88,237	19.4[c]	11.5	3,184	1.8[c]	1.7	(D)	(D)	(D)
Durable goods	37,598	8.2[c]	16.7	1,172	.6[c]	4.5	0	.0[c]	(U)
Transportation and public utilities	15,568	3.4[c]	10.7	13,942	7.7[c]	-16.0	1,050	18.8[c]	1.5
Wholesale trade	8,382	1.8[c]	5.1	7,051	3.9[c]	-14.7	0	.0[c]	(U)
Retail trade	38,161	8.4[c]	-.6	15,707	8.7[c]	-1.6	528	9.5[c]	62.0
Finance, insurance, and real estate	12,997	2.9[c]	8.9	4,003	2.2[c]	8.5	(L)	(L)	(L)
Services	78,131	17.1[c]	8.6	27,030	15.0[c]	8.3	766	13.7[c]	26.8
Government	122,665	26.9[c]	6.8	32,302	17.9[c]	3.7	2,611	46.8[c]	2.0
Federal civilian	8,032	1.8[c]	2.3	5,553	3.1[c]	7.2	1,281	23.0[c]	7.3
Military	3,678	.8[c]	12.9	940	.5[c]	10.7	(L)	(L)	(L)
State and local	110,955	24.3[c]	7.0	25,809	14.3[c]	2.8	1,300	23.3[c]	-2.7

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Davis			Duchesne			Emery		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	2,022,922	100.0[a]	5.2	140,838	100.0[a]	1.1	102,008	100.0[a]	.2
Per capita personal income (dollars)	11,211	72.4[b]	2.1	9,805	63.3[b]	6.8	8,607	55.6[b]	1.9
Derivation of total personal income:									
Total earnings by place of work	1,352,503	100.0[c]	–.3	100,155	100.0[c]	.5	111,843	100.0[c]	–7.4
Less: Contributions for social insurance	75,194	5.6[c]	–2.4	5,501	5.5[c]	–.9	6,389	5.7[c]	–8.4
Plus: Residence adjustment	277,116	20.5[c]	33.8	6,233	6.2[c]	–8.2	–29,671	–26.5[c]	(U)
Equals: Net earnings by place of residence	1,554,425	76.8[a]	4.5	100,887	71.6[a]	.0	75,783	74.3[a]	–1.3
Plus: Dividends, interest, and rent	210,084	10.4[a]	4.9	18,233	12.9[a]	3.8	9,682	9.5[a]	6.0
Plus: Transfer payments	258,413	12.8[a]	9.5	21,718	15.4[a]	4.3	16,543	16.2[a]	4.8
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	1,147,823	84.9[c]	–1.2	69,395	69.3[c]	–2.8	89,842	80.3[c]	–8.3
Other labor income	83,889	6.2[c]	1.8	6,567	6.6[c]	–9.6	12,465	11.1[c]	–12.2
Proprietors' income	120,791	8.9[c]	8.0	24,193	24.2[c]	15.6	9,536	8.5[c]	11.7
Farm	9,148	.7[c]	41.4	6,543	6.5[c]	52.9	3,186	2.8[c]	38.9
Nonfarm	111,643	8.3[c]	6.0	17,650	17.6[c]	6.0	6,350	5.7[c]	1.7
Earnings by industry									
Farm	11,463	.8[c]	31.5	7,665	7.7[c]	42.6	3,602	3.2[c]	32.8
Nonfarm	1,341,040	99.2[c]	–.5	92,490	92.3[c]	–1.8	108,241	96.8[c]	–8.3
Private	676,893	50.0[c]	–1.5	71,279	71.2[c]	–2.1	94,549	84.5[c]	–9.9
Agricultural services and other	2,877	.2[c]	18.2	303	.3[c]	–.2	131	.1[c]	18.0
Mining	1,902	.1[c]	19.8	10,618	10.6[c]	–40.6	39,668	35.5[c]	–20.2
Construction	83,476	6.2[c]	–25.6	17,954	17.9[c]	98.8	8,801	7.9[c]	58.5
Manufacturing	152,247	11.3[c]	–8.4	3,299	3.3[c]	–51.2	173	.2[c]	154.4
Nondurable goods	49,836	3.7[c]	11.7	2,024	2.0[c]	–63.0	(D)	(D)	(D)
Durable goods	102,411	7.6[c]	–15.8	1,275	1.3[c]	–1.0	(D)	(D)	(D)
Transportation and public utilities	44,113	3.3[c]	–2.0	12,002	12.0[c]	11.8	34,411	30.8[c]	–10.1
Wholesale trade	48,383	3.6[c]	5.5	3,645	3.6[c]	–16.3	612	.5[c]	–9.5
Retail trade	108,087	8.0[c]	5.4	7,778	7.8[c]	–3.8	3,143	2.8[c]	2.1
Finance, insurance, and real estate	27,918	2.1[c]	9.7	1,667	1.7[c]	1.9	734	.7[c]	4.3
Services	207,890	15.4[c]	11.5	14,013	14.0[c]	.0	6,876	6.1[c]	.9
Government	664,147	49.1[c]	.5	21,211	21.2[c]	–.8	13,692	12.2[c]	4.6
Federal civilian	435,786	32.2[c]	–.9	4,636	4.6[c]	–10.2	1,248	1.1[c]	.9
Military	118,042	8.7[c]	4.2	624	.6[c]	10.8	508	.5[c]	10.9
State and local	110,319	8.2[c]	3.0	15,951	15.9[c]	1.7	11,936	10.7[c]	4.8

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Garfield			Grand			Iron		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	41,455	100.0[a]	3.0	77,708	100.0[a]	2.6	168,935	100.0[a]	3.2
Per capita personal income (dollars)	9,582	63.8[b]	2.0	11,456	74.0[b]	4.7	8,650	55.0[b]	3.6
Derivation of total personal income:									
Total earnings by place of work	26,848	100.0[c]	1.9	44,904	100.0[c]	.7	120,274	100.0[c]	4.3
Less: Contributions for social insurance	1,430	5.4[c]	.3	2,655	5.9[c]	.8	6,812	5.7[c]	3.4
Plus: Residence adjustment	1,430	5.3[c]	16.4	8,560	19.1[c]	.8	−436	−.4[c]	(U)
Equals: Net earnings by place of residence	26,828	64.7[a]	2.7	50,809	65.4[a]	.7	113,026	66.9[a]	4.4
Plus: Dividends, interest, and rent	7,024	16.9[a]	4.1	12,291	15.8[a]	5.9	25,048	14.8[a]	4.4
Plus: Transfer payments	7,603	18.3[a]	3.1	14,608	18.8[a]	6.6	30,861	18.3[a]	9.0
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	18,958	70.6[c]	−2.3	30,032	66.9[c]	−1.2	89,898	74.7[c]	2.5
Other labor income	1,719	6.4[c]	2.2	2,494	5.6[c]	−3.9	7,678	6.4[c]	1.5
Proprietors' income	6,171	23.0[c]	18.1	12,378	27.6[c]	7.2	22,698	18.9[c]	13.3
Farm	3,118	11.6[c]	24.6	919	2.0[c]	55.0	5,570	4.6[c]	49.2
Nonfarm	3,053	11.4[c]	12.2	11,459	25.5[c]	4.6	17,128	14.2[c]	5.1
Earnings by industry									
Farm	3,484	13.0[c]	21.3	1,146	2.6[c]	37.9	7,150	5.9[c]	35.4
Nonfarm	23,364	87.0[c]	−.3	43,758	97.4[c]	.0	113,124	94.1[c]	2.8
Private	16,103	60.0[c]	.8	33,309	74.2[c]	−1.8	78,831	65.5[c]	1.8
Agricultural services and other	(D)	(D)[c]	(D)	59	.1[c]	7.3	1,548	1.3[c]	(U)
Mining	(D)	(D)	(D)	5,106	11.4[c]	−8.3	4,187	3.5[c]	(U)
Construction	1,040	3.9[c]	−47.6	3,657	8.1[c]	−26.4	8,021	6.7[c]	−14.8
Manufacturing	4,733	17.6[c]	7.4	819	1.8[c]	−9.0	4,404	3.7[c]	−34.3
Nondurable goods	(D)	(D)	(D)	277	.6[c]	−46.6	2,851	2.4[c]	−22.2
Durable goods	(D)	(D)	(D)	542	1.2[c]	42.3	1,553	1.3[c]	−48.9
Transportation and public utilities	2,049	7.6[c]	−2.0	5,045	11.2[c]	7.4	9,525	7.9[c]	13.3
Wholesale trade	(L)	(L)	(L)	1,357	3.0[c]	−6.1	3,459	2.9[c]	.5
Retail trade	1,781	6.6[c]	12.4	5,330	11.9[c]	7.2	18,337	15.2[c]	5.3
Finance, insurance, and real estate	507	1.9[c]	13.2	1,217	2.7[c]	−5.0	4,971	4.1[c]	−13.0
Services	5,426	20.2[c]	11.0	10,719	23.9[c]	6.8	24,379	20.3[c]	12.1
Government	7,261	27.0[c]	−2.9	10,449	23.3[c]	6.5	34,293	28.5[c]	5.1
Federal civilian	3,105	11.6[c]	1.2	4,500	10.0[c]	16.4	8,878	7.4[c]	15.4
Military	167	.6[c]	10.6	297	.7[c]	11.2	801	.7[c]	10.9
State and local	3,989	14.9[c]	−6.4	5,652	12.6[c]	−.3	24,614	20.5[c]	1.7

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Juab			Kane			Millard		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	48,621	100.0[a]	2.7	49,044	100.0[a]	4.7	122,577	100.0[a]	-10.5
Per capita personal income (dollars)	8,162	52.7[b]	5.4	10,019	64.7[b]	1.4	9,521	61.5[b]	-2.6
Derivation of total personal income:									
Total earnings by place of work	26,345	100.0[c]	4.8	23,683	100.0[c]	6.2	98,375	100.0[c]	-21.1
Less: Contributions for social insurance	1,511	5.7[c]	5.1	1,440	6.1[c]	6.5	5,289	5.4[c]	-25.0
Plus: Residence adjustment	5,305	20.1[c]	-9.5	8,934	37.7[c]	-1.4	-6,338	-6.4[c]	(U)
Equals: Net earnings by place of residence	30,139	62.0[a]	2.0	31,177	63.6[a]	3.9	86,748	70.8[a]	-15.1
Plus: Dividends, interest, and rent	7,639	15.7[a]	4.6	9,201	18.8[a]	4.0	18,574	15.2[a]	3.9
Plus: Transfer payments	10,843	22.3[a]	3.5	8,666	17.7[a]	8.5	17,255	14.1[a]	2.3
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	17,832	67.7[c]	3.1	17,173	72.5[c]	4.6	69,708	70.9[c]	-28.4
Other labor income	1,489	5.7[c]	7.8	1,215	5.1[c]	8.7	7,968	8.1[c]	-25.5
Proprietors' income	7,024	26.7[c]	9.0	5,295	22.4[c]	11.1	20,699	21.0[c]	25.2
Farm	2,568	9.7[c]	21.8	994	4.2[c]	30.8	8,355	8.5[c]	66.5
Nonfarm	4,456	16.9[c]	2.8	4,301	18.2[c]	7.4	12,344	12.5[c]	7.3
Earnings by industry									
Farm	3,187	12.1[c]	17.6	1,223	5.2[c]	21.4	11,122	11.3[c]	44.6
Nonfarm	23,158	87.9[c]	3.3	22,460	94.8[c]	5.5	87,253	88.7[c]	-25.4
Private	17,074	64.8[c]	4.3	16,423	69.3[c]	6.5	74,361	75.6[c]	-27.7
Agricultural services and other	(L)	(L)	(L)	(D)	(D)	(D)	601	.6[c]	14.9
Mining	(D)	(D)	(D)	(D)	(D)	(D)	4,364	4.4[c]	-.5
Construction	(D)	(D)	(D)	1,424	6.0[c]	8.1	14,988	15.2[c]	-67.1
Manufacturing	3,207	12.2[c]	19.3	796	3.4[c]	-2.1	5,183	5.3[c]	-22.5
Nondurable goods	(D)	(D)	(D)	(D)	(D)	(D)	1,115	1.1[c]	-19.7
Durable goods	(D)	(D)	(D)	(D)	(D)	(D)	4,068	4.1[c]	-23.2
Transportation and public utilities	797	3.0[c]	3.9	1,189	5.0[c]	10.3	29,988	30.5[c]	(U)
Wholesale trade	1,686	6.4[c]	-3.4	1,212	5.1[c]	1.3	1,252	1.3[c]	-10.9
Retail trade	3,470	13.2[c]	-5.2	3,859	16.3[c]	4.5	6,603	6.7[c]	-12.9
Finance, insurance, and real estate	695	2.6[c]	5.0	688	2.9[c]	22.4	1,653	1.7[c]	-8.5
Services	4,960	18.8[c]	10.1	7,113	30.0[c]	7.2	9,729	9.9[c]	(U)
Government	6,084	23.1[c]	.6	6,037	25.5[c]	3.0	12,892	13.1[c]	-8.3
Federal civilian	542	2.1[c]	8.8	1,478	6.2[c]	2.9	2,176	2.2[c]	-.5
Military	246	.9[c]	10.8	191	.8[c]	10.4	589	.6[c]	10.9
State and local	5,296	20.1[c]	-.5	4,368	18.4[c]	2.7	10,127	10.3[c]	-10.7

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Morgan			Piute			Rich		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	66,181	100.0[a]	6.0	12,082	100.0[a]	9.9	22,212	100.0[a]	12.3
Per capita personal income (dollars)	12,097	78.1[b]	2.5	8,449	54.6[b]	14.0	10,255	66.2[b]	15.7
Derivation of total personal income:									
Total earnings by place of work	26,981	100.0[c]	2.6	5,426	100.0[c]	25.2	9,089	100.0[c]	37.3
Less: Contributions for social insurance	1,404	5.2[c]	3.4	241	4.4[c]	18.7	310	3.4[c]	.6
Plus: Residence adjustment	23,923	88.7[c]	9.5	1,313	24.2[c]	–8.3	5,980	65.8[c]	–5.1
Equals: Net earnings by place of residence	49,500	74.8[a]	5.8	6,498	53.8[a]	16.8	14,759	66.4[a]	16.9
Plus: Dividends, interest, and rent	7,823	11.8[a]	4.6	2,426	20.1[a]	3.9	4,794	21.6[a]	4.7
Plus: Transfer payments	8,858	13.4[a]	8.4	3,158	26.1[a]	1.9	2,659	12.0[a]	3.2
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	18,391	68.2[c]	2.1	2,642	48.7[c]	19.2	4,840	53.3[c]	–1.5
Other labor income	1,588	5.9[c]	2.3	178	3.3[c]	14.8	361	4.0[c]	–3.4
Proprietors' income	7,002	26.0[c]	4.3	2,606	48.0[c]	32.8	3,888	42.8[c]	192.6
Farm	3,202	11.9[c]	1.1	1,915	35.3[c]	45.6	3,213	35.4[c]	366.3
Nonfarm	3,800	14.1[c]	7.2	691	12.7[c]	6.6	675	7.4[c]	5.5
Earnings by industry									
Farm	4,686	17.4[c]	2.4	2,150	39.6[c]	40.0	4,298	47.3[c]	146.4
Nonfarm	22,295	82.6[c]	2.7	3,276	60.4[c]	17.0	4,791	52.7[c]	–1.7
Private	18,101	67.1[c]	2.5	1,595	29.4[c]	18.4	2,309	25.4[c]	–5.5
Agricultural services and other	56	.2[c]	(U)	(L)	(L)	(L)	98	1.1[c]	19.5
Mining	62	.2[c]	(U)	(L)	(L)	(L)	(D)	(D)	(D)
Construction	2,736	10.1[c]	10.2	293	5.4[c]	–6.0	346	3.8[c]	9.5
Manufacturing	5,965	22.1[c]	–3.0	286	5.3[c]	64.4	(D)	(D)	(D)
Nondurable goods	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Durable goods	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Transportation and public utilities	575	2.1[c]	–5.0	192	3.5[c]	15.0	381	4.2[c]	–5.1
Wholesale trade	4,059	15.0[c]	–.5	(L)	(L)	(L)	(D)	(D)	(D)
Retail trade	1,498	5.6[c]	12.4	106	2.0[c]	27.7	394	4.3[c]	–7.4
Finance, insurance, and real estate	592	2.2[c]	6.3	129	2.4[c]	69.7	(D)	(D)	(D)
Services	2,558	9.5[c]	8.3	491	9.0[c]	11.6	662	7.3[c]	5.4
Government	4,194	15.5[c]	3.6	1,681	31.0[c]	15.8	2,482	27.3[c]	2.1
Federal civilian	226	.8[c]	3.7	132	2.4[c]	2.3	297	3.3[c]	.7
Military	214	.8[c]	10.9	60	1.1[c]	11.1	96	1.1[c]	10.3
State and local	3,754	13.9[c]	3.2	1,489	27.4[c]	17.3	2,089	23.0[c]	1.9

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Salt Lake			San Juan			Sanpete		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	8,970,026	100.0[a]	4.5	85,337	100.0[a]	6.8	138,173	100.0[a]	4.3
Per capita personal income (dollars)	12,567	81.2[b]	3.5	7,414	47.9[b]	9.0	8,372	54.1[b]	5.0
Derivation of total personal income:									
Total earnings by place of work	7,758,609	100.0[c]	4.8	63,375	100.0[c]	8.3	74,734	100.0[c]	7.8
Less: Contributions for social insurance	469,702	6.1[c]	4.5	3,454	5.5[c]	6.7	3,955	5.3[c]	9.2
Plus: Residence adjustment	−697,589	−9.0[c]	(U)	−5,257	−8.3[c]	(U)	18,664	25.0[c]	−5.5
Equals: Net earnings by place of residence	6,591,318	73.5[a]	3.9	54,664	64.1[a]	7.2	89,443	64.7[a]	4.7
Plus: Dividends, interest, and rent	1,255,496	14.0[a]	5.0	9,967	11.7[a]	5.3	20,022	14.5[a]	4.7
Plus: Transfer payments	1,123,212	12.5[a]	7.7	20,706	24.3[a]	6.5	28,708	20.8[a]	3.8
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	6,563,264	84.6[c]	4.8	48,121	75.9[c]	6.4	49,965	66.9[c]	7.2
Other labor income	586,660	7.6[c]	3.9	4,409	7.0[c]	9.9	4,790	6.4[c]	9.8
Proprietors' income	608,685	7.8[c]	5.8	10,845	17.1[c]	16.9	19,979	26.7[c]	8.9
Farm	6,581	.1[c]	−4.8	4,520	7.1[c]	37.8	9,720	13.0[c]	11.9
Nonfarm	602,104	7.8[c]	5.9	6,325	10.0[c]	5.5	10,259	13.7[c]	6.2
Earnings by industry									
Farm	10,444	.1[c]	−2.3	5,253	8.3[c]	31.3	12,859	17.2[c]	9.2
Nonfarm	7,748,165	99.9[c]	4.8	58,122	91.7[c]	6.6	61,875	82.8[c]	7.6
Private	6,536,521	84.2[c]	5.3	40,080	63.2[c]	7.9	41,347	55.3[c]	8.4
Agricultural services and other	16,426	.2[c]	−2.6	75	.1[c]	15.4	508	.7[c]	14.7
Mining	103,062	1.3[c]	33.7	11,899	18.8[c]	.0	263	.4[c]	21.8
Construction	482,207	6.2[c]	−7.5	6,316	10.0[c]	38.1	5,338	7.1[c]	2.0
Manufacturing	1,198,729	15.5[c]	2.4	2,227	3.5[c]	25.9	12,018	16.1[c]	8.1
Nondurable goods	284,597	3.7[c]	8.1	1,179	1.9[c]	14.0	10,111	13.5[c]	21.1
Durable goods	914,132	11.8[c]	.7	1,048	1.7[c]	42.6	1,907	2.6[c]	−31.1
Transportation and public utilities	834,250	10.8[c]	6.5	2,833	4.5[c]	−2.0	4,064	5.4[c]	5.5
Wholesale trade	689,562	8.9[c]	−2.9	(D)	(D)	(D)	1,036	1.4[c]	49.9
Retail trade	798,725	10.3[c]	3.4	4,179	6.6[c]	12.4	6,209	8.3[c]	10.3
Finance, insurance, and real estate	615,668	7.9[c]	7.1	(D)	(D)	(D)	2,010	2.7[c]	7.9
Services	1,797,892	23.2[c]	13.6	10,900	17.2[c]	2.2	9,901	13.2[c]	8.9
Government	1,211,644	15.6[c]	2.4	18,042	28.5[c]	4.0	20,528	27.5[c]	5.9
Federal civilian	215,459	2.8[c]	4.1	3,942	6.2[c]	16.1	2,020	2.7[c]	.9
Military	43,273	.6[c]	6.7	465	.7[c]	11.0	681	.9[c]	10.9
State and local	952,912	12.3[c]	1.8	13,635	21.5[c]	.7	17,827	23.9[c]	6.3

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Sevier			Summit			Tooele		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	158,333	100.0[a]	6.5	212,888	100.0[a]	5.6	335,460	100.0[a]	3.6
Per capita personal income (dollars)	10,157	65.6[b]	7.3	15,906	102.8[b]	2.8	11,580	74.8[b]	3.7
Derivation of total personal income:									
Total earnings by place of work	111,568	100.0[c]	7.9	125,919	100.0[c]	10.5	277,778	100.0[c]	.8
Less: Contributions for social insurance	6,413	5.7[c]	6.6	7,171	5.7[c]	10.6	15,063	5.4[c]	-2.9
Plus: Residence adjustment	819	.7[c]	-38.8	50,107	39.8[c]	-3.9	-9,759	-3.5[c]	(U)
Equals: Net earnings by place of residence	105,974	66.9[a]	7.3	168,855	79.3[a]	5.8	252,956	75.4[a]	2.9
Plus: Dividends, interest, and rent	22,674	14.3[a]	4.5	28,731	13.5[a]	5.0	26,259	7.8[a]	4.9
Plus: Transfer payments	29,685	18.7[a]	5.0	15,302	7.2[a]	5.2	56,245	16.8[a]	6.0
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	81,454	73.0[c]	6.0	93,641	74.4[c]	11.2	242,698	87.4[c]	.0
Other labor income	8,206	7.4[c]	6.2	6,520	5.2[c]	11.1	17,690	6.4[c]	8.6
Proprietors' income	21,908	19.6[c]	16.4	25,758	20.5[c]	7.8	17,390	6.3[c]	6.2
Farm	5,676	5.1[c]	68.9	6,245	5.0[c]	17.8	3,893	1.4[c]	13.7
Nonfarm	16,232	14.5[c]	5.0	19,513	15.5[c]	5.0	13,497	4.9[c]	4.2
Earnings by industry									
Farm	7,396	6.6[c]	47.6	7,529	6.0[c]	14.6	4,858	1.7[c]	11.0
Nonfarm	104,172	93.4[c]	5.9	118,390	94.0[c]	10.3	272,920	98.3[c]	.6
Private	81,985	73.5[c]	7.2	101,377	80.5[c]	11.2	93,199	33.6[c]	-4.3
Agricultural services and other	121	.1[c]	-1.5	762	.6[c]	-1.1	306	.1[c]	-19.4
Mining	11,320	10.1[c]	-.5	2,939	2.3[c]	-21.0	(D)	(D)	(D)
Construction	9,966	8.9[c]	76.2	8,744	6.9[c]	-1.9	(D)	(D)	(D)
Manufacturing	9,091	8.1[c]	-2.8	3,189	2.5[c]	-3.4	26,605	9.6[c]	-14.8
Nondurable goods	1,797	1.6[c]	34.9	652	.5[c]	26.6	24,360	8.8[c]	-15.3
Durable goods	7,294	6.5[c]	-9.1	2,537	2.0[c]	-8.9	2,245	.8[c]	-8.4
Transportation and public utilities	17,582	15.8[c]	-2.1	6,907	5.5[c]	-4.2	9,239	3.3[c]	7.8
Wholesale trade	3,574	3.2[c]	-2.5	1,890	1.5[c]	12.2	693	.2[c]	.7
Retail trade	11,684	10.5[c]	2.5	16,180	12.8[c]	5.2	12,113	4.4[c]	.0
Finance, insurance, and real estate	3,521	3.2[c]	8.4	15,596	12.4[c]	51.0	2,754	1.0[c]	6.9
Services	15,126	13.6[c]	10.8	45,170	35.9[c]	13.5	22,746	8.2[c]	-4.1
Government	22,187	19.9[c]	1.2	17,013	13.5[c]	4.8	179,721	64.7[c]	3.4
Federal civilian	5,554	5.0[c]	1.4	1,357	1.1[c]	7.4	150,735	54.3[c]	4.0
Military	651	.6[c]	10.9	526	.4[c]	10.7	8,960	3.2[c]	-10.3
State and local	15,982	14.3[c]	.8	15,130	12.0[c]	4.3	20,026	7.2[c]	6.6

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Uintah			Utah			Wasatch		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	215,194	100.0[a]	.2	2,144,980	100.0[a]	4.2	100,318	100.0[a]	4.3
Per capita personal income (dollars)	9,395	60.7[b]	5.3	8,870	57.3[b]	3.3	10,285	66.4[b]	2.7
Derivation of total personal income:									
Total earnings by place of work	171,221	100.0[c]	–1.4	1,472,950	100.0[c]	4.2	42,256	100.0[c]	12.4
Less: Contributions for social insurance	9,697	5.7[c]	–2.8	89,032	6.0[c]	4.9	2,431	5.8[c]	15.0
Plus: Residence adjustment	–530	–.3[c]	(U)	169,234	11.5[c]	–1.2	31,039	73.5[c]	–4.8
Equals: Net earnings by place of residence	160,994	74.8[a]	–.9	1,553,152	72.4[a]	3.6	70,864	70.6[a]	4.0
Plus: Dividends, interest, and rent	24,611	11.4[a]	4.6	270,227	12.6[a]	4.6	14,146	14.1[a]	4.5
Plus: Transfer payments	29,589	13.7[a]	3.5	321,601	15.0[a]	6.9	15,308	15.3[a]	5.5
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	122,230	71.4[c]	–4.1	1,169,142	79.4[c]	4.3	28,711	67.9[c]	13.7
Other labor income	10,233	6.0[c]	–3.4	99,816	6.8[c]	–1.1	2,200	5.2[c]	18.0
Proprietors' income	38,758	22.6[c]	8.9	203,992	13.8[c]	6.7	11,345	26.8[c]	8.3
Farm	8,111	4.7[c]	38.8	11,591	.8[c]	16.4	2,233	5.3[c]	21.8
Nonfarm	30,647	17.9[c]	3.0	192,401	13.1[c]	6.2	9,112	21.6[c]	5.5
Earnings by industry									
Farm	9,014	5.3[c]	34.1	18,675	1.3[c]	11.1	3,288	7.8[c]	15.6
Nonfarm	162,207	94.7[c]	–2.8	1,454,275	98.7[c]	4.1	38,968	92.2[c]	12.2
Private	131,072	76.6[c]	–4.4	1,208,024	82.0[c]	5.0	28,725	68.0[c]	23.7
Agricultural services and other	425	.2[c]	35.4	4,346	.3[c]	17.8	213	.5[c]	–6.5
Mining	32,419	18.9[c]	–8.1	1,320	.1[c]	24.8	(L)	(L)	(L)
Construction	11,878	6.9[c]	–22.3	100,739	6.8[c]	–1.3	6,843	16.2[c]	52.4
Manufacturing	4,543	2.7[c]	29.9	235,931	16.0[c]	–8.3	880	2.1[c]	2.4
Nondurable goods	981	.6[c]	–1.3	53,704	3.6[c]	19.5	(D)	(D)	(D)
Durable goods	3,562	2.1[c]	42.4	182,227	12.4[c]	–14.2	(D)	(D)	(D)
Transportation and public utilities	23,425	13.7[c]	2.0	73,090	5.0[c]	4.3	2,448	5.8[c]	2.6
Wholesale trade	7,804	4.6[c]	–13.7	41,468	2.8[c]	11.6	2,641	6.3[c]	4.3
Retail trade	14,725	8.6[c]	–1.4	145,029	9.8[c]	3.4	5,229	12.4[c]	3.8
Finance, insurance, and real estate	2,437	1.4[c]	2.2	50,106	3.4[c]	9.1	1,038	2.5[c]	3.9
Services	33,416	19.5[c]	.0	555,995	37.7[c]	12.9	9,401	22.2[c]	40.9
Government	31,135	18.2[c]	4.4	246,251	16.7[c]	.0	10,243	24.2[c]	–11.0
Federal civilian	9,504	5.6[c]	6.8	20,529	1.4[c]	3.9	1,485	3.5[c]	9.9
Military	1,034	.6[c]	10.8	10,517	.7[c]	9.0	392	.9[c]	10.7
State and local	20,597	12.0[c]	3.1	215,205	14.6[c]	–.6	8,366	19.8[c]	–14.6

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Table 1 (continued)
Personal Income and Earnings in Utah Counties by Type and Industrial Source, 1987

	Washington			Wayne			Weber		
	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87	Income/ Earnings ($1,000)	Components as Percent of Totals	Percent Change 1986–87
Income by Place of Residence									
Total personal income	381,800	100.0[a]	6.8	21,424	100.0[a]	16.2	2,023,190	100.0[a]	4.8
Per capita personal income (dollars)	9,177	59.3[b]	–.2	9,886	63.9[b]	11.8	12,622	81.5[b]	4.0
Derivation of total personal income:									
Total earnings by place of work	220,641	100.0[c]	6.4	13,414	100.0[c]	27.4	1,237,882	100.0[c]	3.2
Less: Contributions for social insurance	13,748	6.2[c]	7.6	691	5.2[c]	25.2	74,784	6.0[c]	2.3
Plus: Residence adjustment	12,280	5.6[c]	1.9	1,085	8.1[c]	–12.8	216,553	17.5[c]	7.5
Equals: Net earnings by place of residence	219,173	57.4[a]	6.1	13,808	64.5[a]	23.0	1,379,651	68.2[a]	3.9
Plus: Dividends, interest, and rent	83,071	21.8[a]	4.3	3,510	16.4[a]	4.4	263,147	13.0[a]	4.9
Plus: Transfer payments	79,556	20.8[a]	11.9	4,106	19.2[a]	6.6	380,392	18.8[a]	7.9
Earnings by Place of Work									
Components of earnings									
Wage and salary disbursements	157,295	71.3[c]	7.2	8,242	61.4[c]	27.8	1,026,795	82.9[c]	2.6
Other labor income	13,113	5.9[c]	6.1	756	5.6[c]	42.4	91,762	7.4[c]	3.1
Proprietors' income	50,233	22.8[c]	4.0	4,416	32.9[c]	24.4	119,325	9.6[c]	8.5
Farm	3,089	1.4[c]	15.0	2,005	14.9[c]	46.5	6,377	.5[c]	49.2
Nonfarm	47,144	21.4[c]	3.4	2,411	18.0[c]	10.5	112,948	9.1[c]	6.9
Earnings by industry									
Farm	3,589	1.6[c]	12.8	2,222	16.6[c]	40.0	8,356	.7[c]	35.5
Nonfarm	217,052	98.4[c]	6.3	11,192	83.4[c]	25.1	1,229,526	99.3[c]	3.0
Private	176,595	80.0[c]	5.6	7,101	52.9[c]	41.4	901,594	72.8[c]	2.4
Agricultural services and other	1,943	.9[c]	4.2	(L)	(L)	(L)	3,069	.2[c]	11.7
Mining	1,779	.8[c]	–16.9	82	.6[c]	(U)	2,519	.2[c]	–7.3
Construction	31,836	14.4[c]	–1.6	3,653	27.2[c]	89.2	71,426	5.8[c]	–4.2
Manufacturing	18,473	8.4[c]	10.5	625	4.7[c]	40.4	244,763	19.8[c]	.2
Nondurable goods	11,138	5.0[c]	1.8	(D)	(D)	(D)	82,306	6.6[c]	7.0
Durable goods	7,335	3.3[c]	26.9	(D)	(D)	(D)	162,457	13.1[c]	–2.8
Transportation and public utilities	15,729	7.1[c]	–.4	915	6.8[c]	27.3	67,849	5.5[c]	–13.3
Wholesale trade	8,926	4.0[c]	14.9	418	3.1[c]	–5.3	38,745	3.1[c]	1.6
Retail trade	34,332	15.6[c]	–.4	483	3.6[c]	7.6	131,601	10.6[c]	–1.0
Finance, insurance, and real estate	9,278	4.2[c]	4.7	65	.5[c]	(U)	53,144	4.3[c]	6.8
Services	54,299	24.6[c]	15.3	812	6.1[c]	12.6	288,478	23.3[c]	12.3
Government	40,457	18.3[c]	9.4	4,091	30.5[c]	4.4	327,932	26.5[c]	4.9
Federal civilian	6,915	3.1[c]	9.0	2,139	15.9[c]	7.5	151,991	12.3[c]	8.4
Military	1,450	.7[c]	10.8	88	.7[c]	10.0	12,447	1.0[c]	.0
State and local	32,092	14.5[c]	9.4	1,864	13.9[c]	.8	163,494	13.2[c]	2.1

[a] Income components as a percent of total personal income.
[b] Per capita personal income as a percent of U.S. average.
[c] Earnings components as a percent of total earnings.

(D) Not shown to avoid disclosure of confidential information.
(L) Less than $50,000. Data included in totals.
(U) Unable to calculate due to zero or negative data.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economics Information System.

Utah Business Statistics

UTAH DATA	Jan. 1988	Jan. 1989	% Change from Year Ago	12-Month Average This Year	12-Month Average Last Year	12-Month Average % Change
Total Personal Income (seasonally adjusted) (mil. of dol.) (qtly.)	19,535	NA	NA	NA	19,115	NA
New Corporations (no.)	498	556	11.6%	467	463	0.9%
New Car, Truck, and Motor Home Sales (no.)	4,870	4,761	-2.2%	5,213	4,936	5.6%
Agriculture						
Average Prices Recorded by Farmers (dol.)						
Beef Steers and Heifers (cwt) (thous.)	64.20	74.10	15.4%	68.83	64.07	7.4%
Lambs (cwt)	81.00	62.00	-23.5%	62.23	73.06	-14.8%
Milk Wholesale (cwt)	12.10	12.70	5.0%	11.70	11.89	-1.6%
Alfalfa Hay, Baled (per ton)	74.00	84.00	13.5%	76.42	68.00	12.4%
Cattle Slaughtered (live weight) (thous. of lbs.)	46,229	47,767	3.3%	46,716	42,166	10.8%
Construction						
Total Construction (thous. of dol.) 1	86,235	54,334	-37.0%	118,315	118,792	-0.4%
Residential	30,945	27,269	-11.8%	47,409	48,355	-2.0%
Nonresidential	49,082	18,995	-61.3%	39,329	41,472	-5.2%
Public Works and Utilities	6,208	8,040	29.5%	31,613	28,965	9.1%
Total Permit Construction (thous. of dol.) 2	47,322.9	51,876.0	9.6%	71,750.2	87,844.1	-18.3%
Residential	15,162.8	18,071.0	19.2%	34,658.9	40,501.3	-14.4%
Nonresidential	13,912.7	22,249.4	59.9%	23,366.0	33,457.4	-30.2%
Additions, Alterations, and Repairs	8,347.4	11,555.6	38.4%	13,725.3	13,885.4	-1.2%
New Dwelling Units (no.)	213	237	11.3%	477	597	-20.1%
Employment						
Civilian Labor Force (thous.)	780.0	765.3	-1.9%	759.5	755.5	0.5%
Total Employed Persons	697.6	731.7	4.9%	723.3	709.2	2.0%
Unemployed Persons	42.4	33.6	-20.8%	36.2	46.3	-21.7%
Percent Total Labor Force	5.7	4.4	-22.8%	4.8	6.1	-22.3%
Employees on Nonagricultural Payrolls (thous. of jobs)	636.7	663.2	4.2%	658.7	641.4	2.7%
Manufacturing	94.5	100.4	6.2%	97.8	93.0	5.2%
Mining	8.4	7.8	-7.1%	8.2	8.1	2.1%
Contract Construction	20.7	21.2	2.4%	24.4	26.4	-7.3%
Transportation, Communication, and Utilities	37.7	39.5	4.8%	39.4	37.9	3.9%
Wholesale Trade	34.2	35.7	4.4%	34.9	34.8	0.1%
Retail Trade	116.3	121.6	4.6%	120.2	118.0	1.9%
Finance, Insurance, and Real Estate	33.4	33.0	-1.2%	33.5	33.8	-0.9%
Services 3	148.6	159.2	7.1%	157.8	147.6	6.9%
Federal Government	39.4	39.4	0.0%	39.5	39.8	-0.9%
State Government 4	38.7	39.6	2.3%	38.1	38.0	0.5%
Local Government 4	64.8	65.8	1.5%	64.9	63.9	1.5%
Average Weekly Hours						
Manufacturing	39.6	39.9	0.8%	40.6	39.8	2.0%
Mining	46.2	40.1	-13.2%	41.8	41.6	0.4%
Wholesale Trade	38.3	35.3	-7.8%	37.3	38.1	-2.1%
Retail Trade	27.3	26.4	-3.3%	28.0	28.1	-0.3%
Amount of Unemployment Compensation (thous. of dol.)	7,744.3	7,877.3	1.7%	5,804.5	7,492.9	-22.5%
Finance						
Savings, Savings and Loan Association (mil. of dol.)	2,101.7	2,285.3	8.7%	2,350.6	2,440.7	-3.7%
Tax Collections by the State of Utah (thous. of dol.)						
Total Tax Collections	83,700.0	138,032.4	64.9%	151,562.1	142,270.9	6.5%
Sales and Use Tax	19,219.2	41,980.1	118.4%	55,225.0	48,275.3	14.4%
Motor Fuel Tax	8,817.2	9,712.7	10.2%	10,951.0	9,422.7	16.2%
Individual Income Tax	41,038.6	63,435.0	54.6%	54,750.2	50,325.1	8.8%
Corporation Franchise Tax	2,649.9	2,547.0	-3.9%	6,646.4	7,082.6	-6.2%
Production						
Net Electric Power Utilized (mil. of kwh)	1,272.0	NA	NA	NA	1,153.5	NA
Crude Oil to Refineries (thous. of bbls.)	3,829.2	NA	NA	NA	3,780.6	NA
Crude Oil (thous. of bbls.)	2,923.7	2,511.6	-14.1%	2,722.0	2,928.3	-7.0%
Natural Gas (mil. of cu. ft.)	25,579.8	25,437.6	-0.6%	23,112.1	21,828.3	5.9%
Coal (thous. short tons)	1,613.0	1,494.0	-7.4%	1,497.1	1,327.3	12.8%
Tourism/Travel						
Air Passengers (total no. on and off) (S.L. Int'l Airport)	799,229	900,976	12.7%	875,801	848,316	3.2%
Highway Traffic Count Across State Lines	NA	29,022	NA	NA	NA	NA
Transient Room Taxes (thous. of dol.)	1,400.8	228.8	-83.7%	527.2	494.5	6.6%
Visits, State, Nat'l. Parks, Monuments (thous.)	301.9	262.2	-13.2%	1,100.3	1,061.2	3.7%
Utilities						
Telephone Lines in Service (Mt. Bell)(Residential)	486,449	495,958	2.0%	489,389	480,634	1.8%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	178,159	183,595	3.1%	181,483	176,271	3.0%
Electric Customers (Residential)	478,914	484,788	1.2%	477,206	473,661	0.7%
Electric Customers (Commercial)	46,702	47,929	2.6%	46,929	46,332	1.3%
Natural Gas Customers (Residential & Commercial)	459,446	470,120	2.3%	460,140	447,791	2.8%
Natural Gas Customers (Industrial)	548	558	1.8%	550	553	-0.5%

Utah Business Statistics

UTAH DATA	Jan. 1988	Jan. 1989	% Change From Year Ago	12 Month Average This Year	12 Month Average Last Year	12 Month Average % Change
Davis County						
Non-Ag. Employment (thous.)	50.0r	51.8f	3.6%	52.6	52.1	1.0%
Unemployment Rate	5.4r	3.8	-29.6%	4.2	5.4	-22.5%
Auth. Permit Construction (thous. of dol.)	4,139.1	4,176.8	0.9%	9,206.8	12,509.4	-26.4%
New Dwelling Units (no.)	29	33	13.8%	69	89	-22.8%
Postal Receipts (thous. of dol.)	383.2	546.6	42.6%	438.5	387.8	13.1%
Electric Customers (Residential)	48,050	49,279	2.6%	48,198	47,452	1.6%
Electric Customers (Commercial)	3,385	3,620	6.9%	3,482	3,300	5.5%
Natural Gas Customers (Residential)	50,143	51,626	3.0%	50,523	48,983	3.1%
Natural Gas Customers (Industrial)	52	54	3.8%	53	52	1.9%
Telephone Lines in Service (Mt. Bell)(Residential)	54,774	56,095	2.4%	55,457	54,829	1.1%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	10,897	11,653	6.9%	11,396	10,620	7.3%
Salt Lake County						
Non-Ag. Employment (thous.)	329.6r	340.3f	3.2%	340.7	333.3	2.2%
Unemployment Rate	6.0r	4.0	-33.3%	4.4	5.5	-20.5%
Auth. Permit Construction (thous. of dol.)	16,599.3	26,086.0	57.2%	30,534.9	39,963.6	-23.6%
New Dwelling Units (no.)	91	104	14.3%	179	227	-20.8%
Postal Receipts (thous. of dol.)	6,903.6	7,881.1	14.2%	8,054.7	7,363.2	9.4%
Electric Customers (Residential)	240,253	243,697	1.4%	240,025	236,720	1.4%
Electric Customers (Commercial)	20,355	20,968	3.0%	20,450	20,008	2.2%
Natural Gas Customers (Residential)	221,888	224,840	1.3%	221,115	217,535	1.6%
Natural Gas Customers (Industrial)	233	239	2.6%	237	239	-0.8%
Telephone Lines in Service (Mt. Bell)(Residential)	229,290	233,038	1.6%	230,600	227,174	1.5%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	110,038	111,708	1.5%	111,154	109,904	1.1%
Utah County						
Non-Ag. Employment (thous.)	77.1r	80.8f	4.8%	77.7	74.9	3.8%
Unemployment Rate	6.3r	3.8	-39.7%	4.2	6.7	-37.5%
Auth. Permit Construction (thous. of dol.)	3,728.3	11,159.6	199.3%	11,242.1	12,464.2	-9.8%
New Dwelling Units (no.)	15	24	60.0%	67	90	-25.2%
Postal Receipts (thous. of dol.)	844.4	1,217.6	44.2%	1,225.6	935.8	31.0%
Electric Customers (Residential)	51,840	53,054	2.3%	52,406	52,162	0.5%
Electric Customers (Commercial)	5,941	5,967	0.4%	5,980	6,245	-4.2%
Natural Gas Customers (Residential)	61,711	63,104	2.3%	61,871	60,381	2.5%
Natural Gas Customers (Industrial)	69	75	8.7%	69	68	0.6%
Telephone Lines in Service (Mt. Bell)(Residential)	64,566	66,271	2.6%	64,823	62,554	3.6%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	19,619	20,965	6.9%	20,273	18,911	7.2%
Weber County						
Non-Ag. Employment (thous.)	60.2r	62.3f	3.5%	61.6	60.3	2.0%
Unemployment Rate	7.9r	5.0	-36.7%	5.4	7.1	-24.0%
Auth. Permit Construction (thous. of dol.)	1,735.3	2,420.3	39.5%	5,509.2	8,258.4	-33.3%
New Dwelling Units (no.)	7	13	85.7%	46	66	-29.9%
Postal Receipts (thous. of dol.)	582.5	709.7	21.8%	682.0	608.8	12.0%
Electric Customers (Residential)	53,712	54,259	1.0%	53,568	52,904	1.3%
Electric Customers (Commercial)	4,914	5,064	3.1%	4,932	4,860	1.5%
Natural Gas Customers (Residential)	49,974	50,749	1.6%	49,879	49,070	1.6%
Natural Gas Customers (Industrial)	84	81	-3.6%	83	85	-2.0%
Telephone Lines in Service (Mt. Bell)(Residential)	46,119	46,932	1.8%	46,565	45,994	1.2%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	11,288	12,084	7.1%	11,942	11,092	7.7%

1 Obtained from F.W. Dodge Statistics.
2 Obtained from *Utah Construction Report*.
3 Includes services by nonprofit and religious organizations.
4 Includes public schools and college institutions.

NA Not Available
r Revised
f Forecast

Sources:

Personal Income	U.S. Department of Commerce, Bureau of Economic Analysis.
New Corporations	Utah Secretary of State.
New Car and Truck Sales	Utah State Tax Commission, Economic and Statistical Unit.
Agriculture	U.S. Department of Agriculture, Utah Agricultural Statistics Service, *Utah Agriculture*.
Construction Data	F.W. Dodge Statistics and Bureau of Economic and Business Research, *Utah Construction Report*.
Employment Data	Utah Department of Employment Security.
Savings Information	Utah Savings and Loan Institutions.
Tax Collections	Utah State Tax Commission.
Net Electric Power Utilized	Cooperating Utah Power Companies.
Crude Oil Production	Area Oil Refineries.
Natural Gas Production	Utah Department of Oil, Gas, and Mining.
Coal Production	U.S. Department of Energy.
Air Passengers	Salt Lake City International Airport, Statistics Division.
Highway Traffic Count	Utah Department of Transportation.
Visits to State and National Parks and Monuments	U.S. Forest Service, Utah State Parks and Recreation Department.
Utilities Data	Cooperating Utah Utility Companies.
Postal Receipts	Postmasters in Davis, Salt Lake, Utah and Weber Counties.

Bureau of Economic and
Business Research
University of Utah
Salt Lake City, Utah 8411;
Return Postage Guaranteed
(Non-Profit Organization)

Non-Profit Org.
U.S. Postage Paid

Permit No. 1529
Salt Lake City, Utah

NATIONAL DATA	Jan. 1988	Jan. 1989	% Change from Year Ago	12-Month Average This Year	12 Month Average Last Year	12-Month Average % Change
U.S. Gross National Product (seasonally adjusted) (bil.) (qtly.)	4,724.5	5,116.8	8.3%	4,896.9	4,554.4	7.5%
Total Personal Income (seasonally adjusted) (bil. of dol.)	3,921.8	4,271.9	8.9%	4,091.3	3,803.4	7.6%
Industrial Production Indexes (seasonally adjusted) (1977=100)	134.4	141.0	4.9%	137.7	130.5	5.5%
Total Non-Farm Bus. Expend. on New Plants & Equip. (bil.) (qtly.)	412.0	465.5	13.0%	434.1	391.1	11.0%
Index of Leading Indicators (1982=100)	138.7	145.9	5.2%	143.1	139.8	2.4%
Price Indexes						
Consumer Price Indexes (not seasonally adjusted) (1982-84=100)						
CPI-U (All Urban Consumers) All Items	115.7	121.1	4.7%	118.7	114.0	4.1%
CPI-U (All Urban Consumers) Food & Beverages	115.7	122.0	5.4%	118.7	113.8	4.3%
CPI-U (All Urban Consumers) Housing	116.2	120.7	3.9%	118.8	114.6	3.7%
CPI-U (All Urban Consumers) Transportation	107.1	111.1	3.7%	109.1	105.8	3.1%
CPI-U (All Urban Consumers) Medical Care	134.4	143.8	7.0%	139.4	130.8	6.6%
CPI-U (All Urban Consumers) Energy	87.4	89.0	1.8%	89.4	88.9	0.6%
Producer Price Index (not seasonally adjusted) (1982=100)						
Producer Price Index, All Finished Goods	106.2	111.0	4.5%	108.4	105.5	2.7%
GNP Price Deflator (1982=100) (qtly.)	119.4	125.2	4.9%	122.2	117.9	3.6%
Civilian Employment (seasonally adjusted)						
Total Civilian Labor Force (mil.)	121.0	123.4	2.0%	121.9	120.0	1.6%
Total Civilian Employment (mil.)	114.1	116.7	2.3%	115.2	112.7	2.2%
Unemployment Rate	5.8	5.4	-6.9%	5.5	6.1	-10.6%
Construction						
Total Construction (mil. of dol.)	15,112.6	15,776.3	4.4%	20,445.9	21,258.6	-3.8%
Residential	6,739.3	7,514.7	11.5%	9,914.1	9,943.2	-0.3%
Nonresidential	5,839.7	6,081.0	4.1%	6,931.9	7,501.5	-7.6%
Non-Building	2,533.6	2,180.6	-13.9%	3,600.0	3,836.4	-6.2%
New Dwelling Units (no.)	86,614	90,829	4.9%	119,075	129,399	-8.0%
Interest Rates						
Short Term (3-month Treasury bill rate)	5.90	8.29	40.5%	6.87	5.86	17.2%
Long Term (30-year Treasury bond yields)	8.82	9.07	2.8%	9.00	8.74	3.0%
Prime Rates Charged by Banks on Short-term Business Loans (avg.)	8.75	10.50	20.0%	9.46	8.31	13.9%
Mortgage Rates (new homes)	8.75	9.20	5.1%	8.85	8.91	-0.6%

Sources: *Business Conditions Digest*, U.S. Department of Commerce: U.S. Gross National Product, Total National Personal Income, Industrial Production Indexes, Total Business Expenditures for New Plant Equipment, Index of Leading Indicators, GNP Price Deflator, National Employment Data, Interest Rates.

F.W. Dodge Report, McGraw-Hill: National Construction Data.

Survey of Current Business, U.S. Department of Commerce: New Home Mortgage Rates.

Utah Labor Market Report, Utah Department of Employment Security: Consumer Price Indexes, Producer Price Index.

Chase N. Peterson, *President, University of Utah*
John Seybolt, *Dean, Graduate School of Business*

BUREAU OF ECONOMIC AND BUSINESS RESEARCH

R. Thayne Robson, Director
Frank C. Hachman, Associate Director

STAFF OF THE BUREAU OF ECONOMIC AND BUSINESS RESEARCH

Mari Lou Wood, Office Manager
Cathy Crawford, Administrative Assistant
Diane Gillam, Associate Accountant
Lee Carberry, Administrative Secretary
Geylene Roethel, Administrative Secretary
Michael Rhou, Clerk

Boyd L. Fjeldsted

James B Peters

Research Analysts, Research Assistants and Programmers
Terry Brewer
Jon Crispin Little
Cindy Lewis
Mark Oberg
Gary Ricks
Austin Sargent
James Wood

U8960-2 A

uebr

Utah Economic and Business Review

Volume 49
Numbers 5 and 6
May/June 1989

BEBR

graduate school
of business
bureau of economic and
business research
university of utah

Utah's Emerging High Technology Companies

Jan Elise Crispin-Little, Research Analyst
John Brereton, Brereton Group

High technology, technological change, innovation—these concepts form the core of many state economic development strategies. The objective is to create and promote new high technology companies that will in turn, provide jobs and create wealth in the local economy. It is a strategy that is well-founded. Historically, technological changes that result in new innovation are the catalysts in economic growth. Moreover, aging industrial structures (i.e., low tech manufacturing industries, iron, steel and shipbuilding) are poor "seedbeds" for new firm formation.

There is a growing body of evidence that suggests the new technology industries also provide fertile environments that foster rapid growth. High technology firms have a larger economic impact on the local economy because they tend to display spatially diverse input and output linkages.[1] In essence, new technologies may well compensate for declines in industries once considered staples of regional economies.[1]

In theory, fostering technology is a commendable approach to economic development; however, implementation is complicated. Many factors affecting new company formation in general, and the formation of high tech companies in particular, are beyond the scope of public policy. High technology embodies an entrepreneurial spirit that supercedes the legislative process. Certain concentrations of activity (referred to as agglomeration) are necessary to achieve a vital level of economic benefit. (This occurs when one or more companies have become successful enough to form a nucleus about which other companies can spring.) Again, development of an agglomeration generally occurs despite public policy rather than as the result of public policy.

Even so, many questions must be answered before a conclusion can be made. What determines whether a company will be successful? Why does one company flourish and another fail when both have innovative products? What, if anything, can state agencies do to increase a company's chances of succeeding? This study makes no pretense of providing definitive answers. Rather, it seeks to educate policymakers as to the challenges facing young companies, with the hope that this information will be beneficial in designing and implementing policies that encourage technology development.

---

[1] Ray Oakey, *High Technology Small Firms: Regional Development in Britain and the United States*, St. Martins Press, New York (1984) pp. 4-20.

A Case Study Approach

To understand more completely the problems faced by small, emerging firms, a case study has been completed for each of 10 Utah-based, high technology companies. The progress of each company will be evaluated annually. The objective is to understand the development process of high tech companies (including the innovation process) and how such companies overcome financing, management and marketing hurdles. A case study of each company has been included in this article.

The selected companies met two criteria. At the end of calendar year 1987 the company had to (1) employ fewer than 50 people, and (2) have sales or revenues less than $3 million annually. The founder or president or both) of each company was interviewed and asked to briefly outline the company's history; to identify the source of both initial funding and follow-on financing; to describe the company's product and management team; and finally, to provide an executive opinion detailing the advantages and limitations of operating a business in Utah. This report reflects the interpretations of those interviews.

The age of the companies (measured by the founding date) ranged from four years to 10 years. Company size (measured by the employment level at the end of calendar year 1987) ranged from six to 40 employees. Sales for the same time period ranged from zero to $2.8 million. Exhibit 1 identifies the companies and their specific characteristics.

The technologies under development at these companies vary dramatically; however, they all share at least one similarity, that is, the products are "high technology" or science-based and have been developed from new innovations and inventions generated by scientific activity. Even those companies developing second and third generation products are still heavily involved in the R&D process.

The 10 profiled firms are in various stages of the product development process. A few have more than one product on the market. Some are in the process of developing a second generation product. Others are still at the R&D stage.

Exhibit 1.
Characteristics of Fledgling Companies

Company	Year Founded	Research Sector	Employment 1987	Sales 1987	Source of Initial Financing
Anesta Corporation	1985	Pharmaceuticals	6	$ 59,000	Founders
Bonneville Scientific, Inc.	1981	Robotics	10	620,000	SBIR Phase I
Bunnell, Inc.	1980	Medical Equipment	11	440,000	UIC*
Capital Solutions, Inc.	1985	Software	12	732,000	Founder
CardioPulmonics, Inc.	1985	Medical Equipment	12	0	SBIR Phase I
Clyde, Inc.	1981	Software	40	2,200,000	Founder
Globesat, Inc.	1984	Satellites	15	200,000	R&D Partnership
Hart Scientific, Inc.	1979	Measuring Devices	35	2,500,000	Founders
Megahertz	1985	Computer Peripherals	14	2,800,000	Founders
TheraTech	1985	Pharmaceuticals	23	1,200,000	Founders

* Utah Innovation Center.
Source: Bureau of Economic and Business Research, University of Utah, 1989.

Unfortunately, even the most promising companies will not escape the law of averages. It is extremely difficult for a small company to become a large, successful one—a phenomenon that has been aptly described as "a natural consequence of external conditions." Scarce resources (typically capital and management), small market niches, and trying to sustain the original sense of entrepreneurship, have all been identified as culprits. One company has already ceased operations. Capital Solutions, founded by Mike St. Claire in 1986, closed its doors in July 1988. Of those remaining, only one or two will become Utah's next success stories. A handful will survive, but only as small companies.

Regardless of their future success, all exemplify what can be done. Their problems are similar to those encountered by many young, high tech firms. Small, emerging companies were selected with the hope that their experiences might help others make it over the hurdles and rise to the top.

The Founders

Over time, the level of success achieved by a company is closely tied to the level of business acumen of the founder or president. High tech imposes yet another requirement—technical ability. The importance of this technical component cannot be understated. In high tech, the technical barriers to entry are much higher than in traditional manufacturing sectors. Therefore, at least in the beginning, these companies need a leader with highly technical skills; management ability is of lesser importance. And though some entrepreneurs have a combination of technical ability and business acumen, they generally lack the latter to a higher degree; a concept that is borne out in this study.

Six companies (Bonneville, Bunnell, Clyde, Globesat, Hart Scientific, and TheraTech) were founded by technical entrepreneurs (individuals with backgrounds in engineering, science, or medicine) with little or no business experience. In only four of these six cases is the original founder still involved in daily management activities. The two founders of Hart Scientific replaced themselves with an experienced business entrepreneur, and now hold executive positions more suited to their skills. The founders of Bunnell (Dr. Bert Bunnell), Globesat (Dr. Rex Megill), TheraTech (Drs. Kim, Higuchi, and Patel), and Bonneville (Alan Grahn and Lynn Astle) have acquired management skills as their companies have grown. The founder of Clyde (Alan Clyde) has left the company completely.

Three of the companies included in this study (CardioPulmonics, Anesta Corp., and Megahertz) were co-founded by both a technical entrepreneur and a business entrepreneur. Capital Solutions was founded by an individual with both technical and business experience.

"Why?"

"Why did you start your own business?" Each entrepreneur had a different explanation, but the motivations were similar. A common notion is that financial reward is the prime motivation in the creation of a new company. Certainly, the prospect of financial gain played an important role; in fact most entrepreneurs indicated it was indeed one incentive. However, when the given reasons were prioritized, the potential for reaping great financial rewards ranked last.

Solving a problem or filling an existing niche were the driving forces for most of these entrepreneurs. In every instance, the creative, technical, or scientific expertise of the founder was challenged; this challenge provided the impetus needed to form a company. Each entrepreneur expressed the importance of making a contribution to his respective industry as yet another incentive. Some philosophical motivations were expressed. One entrepreneur indicated that the motivation behind forming his company came, when as a senior at the University of Utah, he was diagnosed with cancer. During his stay in the hospital, he decided to make medicine his career, and ultimately design equipment to help other patients. His product, a Life Pulse High Frequency Ventilator, assists the respiration of critically-ill infants.

Having the independence to pursue a specific interest was another often repeated sentiment. These founders wanted to develop and implement their own ideas and innovations which, in many cases, were in direct opposition to the goals of their organizations. The thrust was not so much the wanting to be one's own boss as it was to follow a particular interest. This is the very reason that Hart Scientific was founded. The founders (Hart and Hurst) jointly developed an instrument that their employer was not interested in manufacturing. As a result, they left and formed their own firm.

"It's My Business"

"It's my business" is the motto of most entrepreneurs. A hands-on style of management, coupled with a strong sense of commitment to the organization usually means the entrepreneurial manager will be involved with every detail of the company. He reserves the right to directly influence any decisions that are of importance or interest to him regardless of the organizational level of such decisions. When a firm is in the early start-up stage, this type of commitment may be both a necessity and a plus. However, as the company grows, this practice may quickly become counterproductive as the daily management requirements exceed the business acumen of the entrepreneur, and he fails (or is unable) to delegate responsibility to others.

In a newly established high tech company, an innovative product commands high prices resulting in high margins masking management inefficiencies. As the company's market grows, more demands are placed on the entrepreneur. Those who can develop the necessary business skills will likely be more successful. Unfortunately, not all entrepreneurs are willing to admit that they lack expertise in this area. This was the case of Alan Clyde (founder of Clyde Digital, predecessor of Clyde, Inc.).

Clyde's sales initally skyrocketed because Alan Clyde's technical insights were years ahead of the competition. After this initial growth the company performed poorly, and Clyde looked for and found outside financing. After several months, the new directors approached Clyde and suggested that he delegate more of his managerial responsibilities to others. In the long run, he was unable to do this effectively and eventually left the company.

This is an extreme case; however, many of the entrepreneurs admitted that their companies have suffered from their lack of management skills and inability to delegate effectively. Although each has the technical capability and determination necessary to launch a company, once it becomes a going concern the lack of experience and training makes for a constant struggle. Most of the founders were very candid as to their managerial skills or lack thereof. In several instances, they readily admitted their companies were headed for failure until professional management was recruited; and they concentrated entirely upon the technical end of the business. As several founders indicated, the issue is not whether they can or cannot manage a company. Given enough time, most could acquire the needed skills. The key component is time. Most entrepreneurs do not have time to struggle through the management issues when "more important issues are at hand."

"Today Not Tomorrow"

Start-up companies are struggling to survive. This sense of living day-to-day typically results in the entrepreneur-manager developing a short-term perspective that excludes any long-term planning and fosters a reactive approach to problem solving. Furthermore, the reactive manager spends an inordinate amount of time putting out "fires". The daily problems become all-consuming while the company's growth screeches to a halt. Indeed, this has been the case for several of these fledgling companies. Founders of these companies told of their recurring "dark hours" when all seemed lost. One person recounted a bleak period when he did not answer his telephone or open the office because he was afraid of being inundated by bill collectors.

Under such pressures, postponing long-range planning may seem justifiable but, by not planning, the entrepreneur often leads his company into even more severe situations. At least half the emerging companies highlighted in this study did not have a formal business plan. Although every entrepreneur talked at length about the short-term future of the company; the next big sale or the level of employment the company expected to reach within the next two to three months; very few were able to talk about the company's long-term future, and even fewer had business plans that provided a multi-year projection of financial performance. Without a plan, it is difficult to attract investment capital, establish effective banking relationships, allocate resources for new product development, and integrate existing research with product development.

Finance

Perhaps one of the most challenging hurdles faced by young high tech companies is that of locating investment capital. As start-up or first stage enterprises, these companies do not have internally-generated reserves to offset hefty development costs. Moreover, without a track record or asset base, it is difficult to borrow funds. Contrary to popular belief, neither venture capital or bank financing play a significant role in the formation of high tech companies. Most start-ups rely on the savings of the founder for the initial injection of capital. In light of this, it is not surprising that the sole source of start-up capital in more than half of the survey firms came from the founders, their families, or friends.

Some firms have combined founder's capital with money from state or federal programs. Two companies were founded using research monies obtained through the Small Business Innovation Research (SBIR) program. Another company was "incubated" at the Utah Innovation Center, and yet another used an R&D partnership to raise capital.

Follow-on financing is another matter. It is clear from the interviews that the initial investment is quickly spent. To survive, every entrepreneur had to locate a new source of capital. The sources used included venture capital investments, private placements, research grants, cash flow financing and mergers.

Venture Capital

While it is true that venture capital is not a significant source of start-up financing, it plays an extremely important function at the margin in providing the entrepreneur with a secure source of capital. Venture capital also acts as a lead investor in attracting capital for future needs. For example, it is in the best interest of a venture investor to select and finance only those companies most likely to succeed. Once chosen, it is much easier for these companies to obtain additional financing from other sources, namely institutional funds, and to a lesser degree, banks. Venture capitalists also provide a certain degree of managerial expertise (although this varies widely from fund to fund) which in turn may help the young firm grow faster.

The drawback of venture capital is obvious. Because equity is generally traded for this capital infusion, the risk that the entrepreneur may lose internal control of the organization always exists.

In the most extreme case, the entrepreneur may be forced out of the organization completely.

Several of the study firms have been successful in attracting investment dollars from venture capital funds. CardioPulmonics is a notable example of a firm that has been able to tap this capital source despite the fact it has no marketable product at the present time. Since its inception in 1984, CardioPulmonics has received three separate rounds of venture financing totaling more than $2 million, and is now raising a much larger fourth round. The president expects to raise an additional $5 million in venture money before the product is marketed.

Securing such capital is the result of a carefully planned strategy, and is an important lesson for other aspiring entrepreneurs. Venture capitalists are attracted to companies for many reasons. The ones identified most often include: (1) an experienced management team; (2) a product with the potential to reap extraordinary profits; and (3) a sound, realistic business plan.

Cardiopulmonics met all three requirements. One of the company's founders is an experienced entrepreneur with a strong business background; the other is a noted surgeon with experience in medical equipment research and development.

High tech firms have a better chance of attracting venture money when the effort is spearheaded by an experienced entrepreneur. Capable management is such an important ingredient for success that venture investors rank it ahead of a product's market potential. Investors have learned through experience that a company with a solid management team, and perhaps only a slightly better product stands a better chance of success than a company with a superior product but inexperienced management.

Several founders acknowledged that they were unable to move beyond the research stage until an experienced business person or entrepreneur joined the company. Generally, an experienced entrepreneur is familiar with the requirements demanded by venture capitalists, and may even have personal contacts with equity investors. The chances of raising capital using such contacts are much greater than those of the inexperienced technical founder.

Although venture capital is a solution, it is not the right one for every emerging company. A few entrepreneurs refused to use venture money as a remedy for their capital gap. The founders of Megahertz, for example felt that the price, in terms of lost equity and potential loss of managerial control, was simply too great for what the company would receive in return. If venture capital is not the solution for every company, what other outside investments are possible? A private placement was a method used by one of the survey firms.

Private Placements

Private placements range from sophisticated financing programs to informal loans between friends. It is simply the exchange of money for some type of consideration—generally common or preferred stock or warrants. Private placements are popular with entrepreneurs because there is little, if any, dilution of the founder's managerial control. Also, the legal issues and reporting requirements are more flexible than is the case in public offerings. However, private placements have drawbacks as well. The very flexibility that makes these transactions appealing can lead to problems. For example, the founder of one emerging firm indicated that he had structured his private placement in such an unusual way that it was impossible to attract other investors at later stages. He had in effect, closed the door on many second stage financing options.

Research Grants

Even with an experienced management team and formal business plan, some companies are simply not candidates for venture money. Perhaps the product's market is too small, or the investor and the entrepreneur cannot agree on an acceptable level of equity participation. These companies face the same product development costs and marketing hurdles as companies that are candidates for venture capital.

One source that has been used successfully by Utah companies is the Small Business Innovation Research program (SBIR) administered by the federal government. The SBIR program began in 1982 and requires that federal agencies with R&D budgets exceeding $100 million establish a program to help small firms compete for federal contracts.

This program provided the initial funding for two of the survey firms—Bonneville Scientific and CardioPulmonics. Bonneville Scientific has been awarded 16 SBIR grants totaling $1.87 million since its inception in 1981 (about 16 percent of all awards made to Utah firms). The firm has also been successful in converting Phase I grants into the more lucrative and commercially promising Phase II grants. In addition to federal funding, Bonneville has also received a state grant that has allowed the company to continue its research.

Not all companies have the technical capacity to be as successful as Bonneville in securing government research grants. Moreover, there are cash flow problems associated with such programs. For

example, federal agencies can be slow in paying their bills, thus creating tremendous cash flow pressures for small companies. However, if a company has the technical expertise, and the need to support R&D on a prolonged basis, government-sponsored research programs are one solution.

Cash Flow Financing

Financing growth through operations is perhaps the desired method by most entrepreneurs (and the most difficult to sustain). One emerging company has used this particular method effectively.

In 1985, Megahertz Corporation introduced the turboswitch (a peripheral that boosts the response time or speed of a personal computer). Garnering over $1.5 million in sales, it was an immediate success, and resulted in substantial profits for the company. Second and third generation products have been developed and marketed. It is not surprising that after several lucrative years, the company has been approached by venture investors, but according to Spencer Kirk, the company's president, "the price of venture investment is far too high." The management team decided not to relinquish their equity and chose instead to grow at a slower rate.

Megahertz is in an enviable position as it did not have to rely on outside investments. This is a rarity. Funding growth through cash flow requires two things—a high growth market and a product fit to that market. The turboswitch was the right product for the right market at the right time. Furthermore, market growth carried the second and third generation products. Few firms enjoy such good fortune. In fact, with the exception of Hart Scientific, not one other company could effectively use cash flow to finance even R&D operations.

Mergers

The term mergers, as used here, is a catch-all category that includes joint ventures, the formal merging of two or more companies into one entity, and finally the equity investment, exchange or acquisition of one company by another. Each of these strategies has been used by one or more of the survey companies. TheraTech, Inc. (TTI) and Globesat have both used this strategy.

Founded just three years ago, TTI is a rapidly growing, high technology company. Since 1985, the company has increased its employment base to 23 people, and conducts over $1 million each year in R&D. Though TTI was initially financed by the founders, hefty R&D expenditures precluded them as a permanent source of financing. TTI's solution was to align itself with larger companies using research and development partnerships which would allow TTI to further develop its innovative drug delivery system.

Globesat also pursued a merger strategy in a different way and for different reasons. Rather than merge with a larger corporation, Globesat acquired a smaller firm. In the classic sense of a merger, only one company remained. The motivation behind the merger was to link up with a cash flow company which also served as a manufacturing outlet for Globesat's products. As the CEO declared "the other company acted as our venture capitalist."

Again, not all companies can make use of a merger strategy. TTI has capitalized on the technical expertise of the founders, who are well respected within the medical and pharmaceutical industries. Many large organizations in either industry would readily purchase TTI. However, at the present time, the founders want to remain independent and pharmaceutical and medical companies must be satisfied with a joint venture arrangement.

Other Issues

Aside from financial and managerial concerns, high tech companies must deal with a variety of other issues; namely, research and development concerns, marketing, and regulatory hurdles.

Research and Development

Every company in this study conducts research and development on a daily basis. In almost every case, the success of the company ultimately depends upon the success of these efforts. R&D is an expensive endeavor and usually occurs in periods prior to the manufacture and sale of the company's product. Furthermore, a great misconception of high tech entrepreneurs is that R&D efforts always result in successful innovation. This is not always the case; so the entrepreneur does not know what the payoff will be if the company incurs hefty R&D expenditures. This is a double-edged sword. If the company is unable to obtain adequate financing to continue with its R&D efforts, it may be forced to undertake new product development on a much smaller scale. While this approach eliminates the capital problem, it rarely yields the large profits associated with radical leaps forward at the leading edge of product technology. Exacerbating this situation is the product development cycle of high tech products.

New product develpment must be a continual activity in the high tech company. Typically, a high tech company is established to develop one product. Unfortunately, this product usually has a relatively short life cycle; a situation that has not been anticipated by the founder. This highlights a common problem; development of a second or third

generation product. Such development is time consuming and costly. The challenge is to find the level of R&D activity that fits with the company's financial constraints. Most importantly, R&D is not a one-time expenditure. On the contrary, it is an ongoing function of the high tech company. Furthermore, it is rarely as inexpensive or as easy to finish as initially planned. Delays and setbacks are inevitable.

Marketing

One component often overlooked by high tech entrepreneurs is marketing. The entrepreneurs interviewed for this study were no exception. Many commented that marketing lagged far behind the technical development of the product or process. Some were unable to readily identify their target market, or the product's market potential. Others felt that "everyone can use this product."

When marketing is not included in the planning process, it is usually ignored until problems surface. And since marketing functions are almost always foreign to the technical founder, the tendency is to rely on the product's technical prowess as the selling tool. A comment heard more than once was, "with this new product, people will be breaking down our doors." This rarely happens. A well-conceived marketing strategy that leads to a properly targeted and executed launch must be an integral part of the innovation process.

Integrating marketing considerations with technological development is one way to avoid this pitfall. When the innovation reaches a certain stage, both the technical feasibility and the marketing feasibility should be evaluated before the product moves to the next developmental stage. In other words, the innovation must travel two paths. After all, the final test is the willingness of consumers to purchase the product.

High tech companies struggle with the marketing issue for a variety of reasons. In a nutshell, these companies lack those competitive advantages that are at the core of successful marketing programs. For example, small companies do not have the solid, technical reputations on which to draw when marketing a product. They lack a complete product family or a trained technical sales force, or both. Few have follow-on products and after the initial success of a first generation product they simply disappear (or start over from scratch).

Choosing the Right Horse for the Right Race

Choosing the market best suited for a specific product is yet another challenge in developing an effective marketing plan. A strategy that has been tried by two emerging companies is the "market niche" approach. The market niche concept (also referred to as market segment strategy) is simple. A niche or segment market consists of a group of customers who share common needs and exhibit similar buying patterns. The market is segmented by product characteristics (highly technical equipment, for example) and capacity requirements (one-of-a-kind items). Both Hart Scientific and Capital Solutions tried this method with varying degrees of success.

Hart Scientific manufactures and markets highly specialized measuring instruments that are used by large corporations and research universities. As a rule, Hart's customers will require only one or two of these precise instruments. However, the product is expensive and the margins are high. So, although the market is small, the company still realizes a handsome profit.

Capital Solutions is another emerging company that tried this marketing strategy with less desirable results. Capital Solutions developed and sold inventory accounting software designed specifically for the auto glass industry. For this company, the niche strategy did not work for several reasons. First, the niche was too small. Second, it was not a growing segment of the software industry. Third, the product did not command high enough margins to compensate for the lack of sales volume. Finally, the company was competing for market share with more established companies.

Regulatory Requirements

Regulatory requirements are not an issue for all high tech companies, but for those governed by such restrictions, getting a product to market can be a nightmare. The federal program most criticized by executives in this study was the Food and Drug Administration (FDA). Anecdotes describing problems in dealing with FDA reviewers were recounted time after time by entrepreneurs who are developing medical or pharmaceutical products.

FDA has such stringent testing requirements, that the time between prototype development and the manufacture and marketing of a product can be extremely long (in some cases years). The dilemmas faced by such high tech companies are exemplified by the story of Bunnell, Inc.

Like most high tech companies developing medical products, Bunnell needed FDA approval before the marketing of the company's Life Pulse High Frequency Ventilator could begin. Though most of the research for the ventilator had been completed prior to the company's formation, an additional four years of research and testing was required to satisfy FDA reviewers. According to Dr.

Bert Bunnell, president of Bunnell, Inc., the FDA reviewers did not understand the technology of the ventilator or its uses. A complicating factor was the high turnover rate at the agency. Just as one reviewer gained a technical perspective of the product, he or she would leave and the educational process would begin all over again. Dr. Bunnell eventually received approval for his product, but not before his company had incurred incredible costs.

Other high tech companies that specialize in medical or medically-related products should evaluate the perils of running a business while trying to secure FDA approval. In retrospect, Dr. Bunnell offers some tips for survival:

First, do not try shortcuts. Follow the rules as FDA will not make exceptions nor will the reviewers cut corners. Second, limit the scope of the application. The more complicated or foreign the innovation, the longer it will take to be approved. Third, develop a support system within the medical community, and if possible, find a champion within the FDA who is willing to guide the application through the regulatory maze. Finally, be prepared for a long battle and remember consistency, not speed, wins in the end.

Why Utah?

Research shows that small firms are typically established in the area of the founder's home. Without exception, each entrepreneur indicated that this was the primary reason for basing the company in Utah, although they were quick to point out that the state offers other advantages. One advantage is the proximity to and interaction with universities located in Utah; namely, University of Utah, Utah State University and Brigham Young University. At least half of the founders came from university environments (several still maintain university faculty positions).

Another advantage is Utah's labor force. Not only is there a ready pool of technical workers, but those workers exhibit a strong commitment to their employer. For an emerging firm, this level of skill and loyalty is crucial. When a small company faces financial crisis, it is often the workers who sacrifice current pay for future opportunities. This was the case with Capital Solutions. Under extreme financial pressure, the employees opted to continue working even though the company was unable to meet its payroll.

A common remark made by this group of executives is that Utah offers the best of all situations—a lifestyle that is compatible with high tech development but free from the problems presently plaguing other high tech areas. In addition to the state's research facilities, entrepreneurs in Utah enjoy cultural and recreational opportunities, a solid educational system, and an affordable lifestyle. For example, Bill Moeller (founder of Anesta Corp.) came to Utah with some skepticism. However, when he left the employer which brought him to Utah, he decided to start a company in the state because of the advantages.

Utah also has limitations as many entrepreneurs pointed out. The limitation voiced most often was the reluctance of the banking community to lend money to high technology companies. In defense of the banking community, most entrepreneurs think their innovations are valuable. This is not always the case. Bankers, in their endeavor to keep the level of poor investments at a minimum, may also overlook the needs of viable organizations. A prime example of this attitude was offered by the President of Hart Scientific.

As Mr. Hart explains, the founders had completed a contract for the federal government and needed a line of credit for cash flow. They were willing to use the contract for collateral. But, in their opinion, because the request did not involve a real estate transaction or automobile purchase, they were refused. Instead they had to factor their accounts receivable at fifty cents on the dollar in order to continue business operations.

The lack of risk capital is another often-mentioned limitation. While Utah does have a venture capital market, it is small. A few entrepreneurs have been able to take advantage of this market, but indicated it could only fill the company's capital gap for a limited time. To obtain the large sums of money needed for extensive R&D, the founders looked for investors outside the state.

Two founders felt that although the work force is productive and loyal, it lacks that entrepreneurial spirit found in other established high tech centers. They were of the opinion that this spirit is really the essence of a high tech company, and without it the chances of becoming a true success story are reduced.

Conclusion

In discussing the challenges faced by these small firms, one issue is clear. The needs of high technology companies are very different than those of traditional manufacturing companies. First, high technology is extremely research-oriented and its markets are technology-driven. R&D expenditures are high and usually occur in periods prior to the manufacture and sale of the product. Furthermore, R&D efforts do not always result in a successful innovation. Second, life cycles of high tech products are short, resulting in a profit structure that is not uniform and that detracts from the overall security

of the company. This poses a major problem when capital is needed for second or third generation product development. Finally, in many cases, high tech companies are founded by technical entrepreneurs who are unfamiliar with management and marketing issues.

With so many hurdles, it might seem impossible for public policy makers to design and implement programs that benefit or foster technological development. And, in fact, public policy decisions are only effective in certain areas and to varying degrees. For example, the effectiveness of policy implementation that will ameliorate the financial constraints discussed above is still being debated.

On one hand, a state can design and implement financial programs to help fledgling firms. Government incentives may take the form of grants or low interest loans. However, few states have unlimited financial resources. In the end, state agencies, as prudent investors, would either use the same criteria required by venture capital investors or by the financial community in making financial determinations, or they would become a "bank of last resort", investing in companies that other financial institutions have turned away.

Even in those regions where financial considerations are less pressing, establishing such a program does not solve the problem. The banking community is still not involved in the process—an important consideration when one considers the role played by the financial community in fostering high tech in Silicon Valley and Route 128.

Another limitation that clearly falls outside the public arena is the technical founders' lack of business acumen. In the broad sense, it is not the state's job to decide who is eligible to manage or to establish a company, though state-funded agencies can make management teams jump through hoops when state-funded financial assistance is provided.

In spite of these limitations, there are methods by which states can encourage the creation and expansion of technology-oriented enterprises. Maintaining a favorable legislative climate is a prime example of effective public policy. For instance, universities and high tech companies are major spawning grounds for high tech start-ups. More than half of the firms profiled in this stduy are spin-offs from a university or high tech company. In some cases, these companies were established because former employers had no interest in developing the specific innovation or invention.

Legislation that hampers or discourages such spin-offs will eventually defeat economic development efforts as the entrepreneur either abandons his dream completely or locates the company in an area where new firm creation is encouraged.

The state can also play an integral role in fostering high tech development by maintaining a strong commitment to education. While a solid educational system, especially higher education, is beneficial to all businesses, it is imperative to the high tech development.

The relationship between universities and high tech agglomeration can be found throughout the U.S. Silicon Valley in California is anchored by Stanford and Berkeley. Route 128 in Massachusetts is fed by Harvard, MIT, and other local colleges. The Golden Triangle of North Carolina takes advantage of the benefits offered by Duke University, North Carolina State and the University of North Carolina. Given these examples, it is clear that education plays an important role in the expansion of high tech industries.

In summary, it remains to be seen which of these emerging firms will triumph. Of the nine remaining companies, perhaps all will continue along the road to success. A great deal will depend on the abilities of the respective management teams to overcome the challenges that lie ahead.

MAY / JUNE 1989

Anesta Corp.

Background

Anesta Corp. was formed in August 1985 as a result of the early clinical promise and potential of a new anesthetic drug delivery system called Oral Transmucosal Fentanyl Citrate (OTFC). Dr. Theodore Stanley, a prominent anesthesiologist and researcher, is a founder of the company and along with Brian Hague, R.Ph. invented this new non-invasive dosage system. William C. Moeller is also a founder of Anesta, and is currently acting as President and Chief Executive Officer (CEO). Dr. Stanley and Mr. Hague developed the product at the College of Medicine at the University of Utah, as a spin-off of their research efforts. The patent for OTFC is in the University's name; however, Anesta has an exclusive license to further develop and commercialize the product, and plans to develop a range of other pharmaceuticals that can be administered in oral transmucosal (OT) dosage form.

Product

OTFC is a new non-invasive dosage form of the synthetic opiod fentanyl, a potent analgesic, sedative, amnestic and anesthetic. OTFC is currently being used in pre-medication prior to surgery and for analgesia and sedation in pediatric patients undergoing painful diagnostic procedures under an Investigational New Drug Exemption (IND). Other potential applications include use in the emergency room for urgent care or in the treatment of chronic pain in situations where the patient might experience recurring episodes of intense breakthrough pain.

Dr. Stanley developed OTFC during the time he was a professor of Anesthesiology and Surgical Research at the University of Utah, School of Medicine. The origin of this innovative drug delivery system is unusual and illustrates the innovative process. While as a consultant to the University of California at Davis in 1985, Dr. Stanley was asked to help administer a drug to several primates at the University's research center. Hoping to avoid a risky confrontation when the drug was administered, he disguised it in a sugar cube. The plan worked. The primates were sedated with very little discomfort and minimal risk to the research team. This success triggered Dr. Stanley's imagination, and upon returning to Utah, he developed this new method of administering analgesic and sedative drugs to children using the mucosa as the route of delivery.

The OTFC anesthetic dosage form is a candy matrix incorporating fentanyl mounted on a handle or stick. In concept it is similar to a lollipop but does not look like a lollipop. During insertion into the patient's mouth, the patient is instructed to suck vigorously. The drug is absorbed directly into the bloodstream through the mucosal tissues of the mouth, pharynx and esophagus. Appropriate monitoring of the patient's reaction to the drug indicates when it has evoked a suitable response; that is, the patient becomes sleepy or experiences less pain. OTFC can be removed entirely and the amount of drug absorption decreased during administration depending on the clinician's assessment of the patient's response.

OTFC offers several unique advantages over more conventional delivery systems: (1) ease of administration; (2) greater control of effective dosage; (3) safety; and (4) cost effectiveness. Unlike oral digestion or injections where relatively large doses are given intermittently, OTFC is administered in a continuous dosage and administration can be regulated according to the patient's response. Some patients have difficulty swallowing pills or capsules. By using OTFC, medicine can be taken orally without the discomfort of injections.

OTFC can be easily removed, something that is impossible when using nonreversible methods (such as oral administration of pills, capsules or solutions) and difficult with IV and IM injections. When used as an analgesic, the physician or nurse allows the patient to control his own pain relief through self administration of small amounts of the drug by sucking harder or removing OTFC when the desired effect has been achieved. Furthermore, OTFC avoids the adverse effects from the trauma of injections. Moreover, a "dose-to-effect" administration provides a margin of safety in a clinical situation compared to the calculation of IV or IM drug dosage where individual drug tolerance is unknown. OTFC can increase the safety of general anesthesia when used as a premedication by blocking the body's natural stress response, thereby improving hemodynamic balance. Finally, OTFC is a simple, inexpensive and convenient drug delivery system. It eliminates the need for syringes, needles, and drug vials.

Currently, OTFC is being tested in 11 clinical studies at nine respected medical institutions. Four of these studies have been completed. It is anticipated that all reports and tests will be completed and submitted to the Federal Drug Administration (FDA) by the end of 1990. Final approval for the product is expected in 1991 or 1992.

Funding

Facing a prolonged period of testing before OTFC can be marketed, the founders of Anesta have had to rely on a variety of financial sources. Like many other high tech firms in Utah the initial capital

contribution came from the founders, Dr. Stanley and Mr. Moeller. Additionally, the company has been extremely successful in attracting venture dollars. Soon after the initial capital contribution, Mr. Moeller prepared a business plan to solicit other investors. His experience in developing small high tech companies was helpful in attracting venture investors.

The company has financed its development in stages. Morgan, Holland Ventures Corporation in Boston, Massachusetts became the lead venture capital investor in 1986. Subsequent financings included other venture capital firms including Utah Ventures, a Utah-based venture capital fund, other institutional investors and some of the individual shareholders of the company. In total, $1.5 million has been invested in the company through March 31, 1989.

Like many other medically-oriented companies, Anesta has relied on the venture capital market as a source of investment capital for a number of reasons. First, the product requires a lengthy testing period for FDA (in this case four years). During this period, the company will have no income or revenues (other than investments) to offset the development costs and expenses. Also, the company has no track record or asset base to make it eligible for debt financing. Second, the venture is risky. Although preliminary tests for OTFC are promising, until the system is approved, manufactured, and marketed, the future is uncertain. The risk is very high and usually only venture investors are willing to participate. Finally, as a start-up company, Anesta lacks management resources. Venture investors add value to the company by advising the company on strategic issues.

Anesta is attempting to strike a joint venture agreement with pharmaceutical companies. This alliance strategy is a common one for firms like Anesta that are involved in medical or pharmaceutical products. Often, the time between the innovation and its commercialization is so long, that a small company must align itself with a larger company even if it has backing from venture investors. A large company can provide equity dollars as well as assist in the marketing, production and distribution of the product. For its part, the larger company may benefit from the innovation itself, or from the R&D that is undertaken by the small firm. Further, merging with a smaller company is an easy way to enter a niche market.

Market Potential

To attract venture investments, a company's innovation or product must offer extraordinary market potential. Anesta expects to enjoy 100 percent of its market because of its proprietary patents. This market share could result in annual sales of over $100 million for OTFC. As other drugs are converted to this delivery system, the market potential expands exponentially. Potential application of the OT dosage form includes other pharmaceuticals such as drugs for treating cardiovascular problems, cancer, asthma, diabetes, and infectious diseases.

Management and Employment

William Moeller is the President and CEO of Anesta. He is also a founder of the company. He has held senior management positions with several medical companies and has 12 years of experience in the field of anesthesia. As the CEO, he is responsible for the management of the company, and works closely with venture investors and the Board of Directors. His role is a combination of entrepreneur and executive.

Dr. Stanley is a founder and Chairman of both the Board of Directors and of Anesta's Scientific and Medical Advisory Board. He is internationally known for his work in the clinical testing of intravenous, anesthetic drugs and has been a consultant to numerous companies in the investigation of new drugs. He devotes part of his time to company affairs directing the research and clinical testing efforts.

In addition to the CEO, there are eight other full-time employees. The company employs two people on a part-time basis. Including Dr. Stanley, seven employees are involved in R&D. There is virtually no employee turnover. With such a small staff, the company has not had problems finding qualified personnel and researchers.

Utah: An Executive Opinion

According to Anesta's founders, the relationship with the University of Utah is the most important advantage of doing business in the state. The company has a close working affiliation with the University's School of Medicine, thus providing an expeditious way of rapidly conducting the initial screening and testing of a wide range of drugs. Further, the level of activity in biomedical device development at the University of Utah, and the extensive experience and contacts of the founders and members of the company's Scientific and Medical Advisory Board, place Anesta in a favorable position to identify and assimilate other emerging technologies that fit within the company's strategy.

Although the company has had a rewarding relationship with the University, as it looks to the future there are a few dark clouds. In the view of some Utah out-of-state investors, Utah is not perceived as a desirable location to build an integrated pharmaceutical company. It may be a great place to capitalize on the research and development infrastructure and start a company, but there is an image problem.

Executive recruiters tell venture capitalists that first-rate executives are reticent to locate in Utah because of negative perceptions about the state. This

reticence results in a management gap which in turn exacerbates the state's capital gap. It is a reinforcing cycle. However, Anesta's executives believe the negative impressions held by non-Utahns are more imaginary than real. The CEO of the company, for example, moved to Utah several years ago. He enjoys the quality of life found in the state and has not had any problem fitting in. Nevertheless, he admits the perceptions persist and may slow high technology development in Utah.

Bunnell Incorporated

Background

Bunnell Incorporated has overcome almost every conceivable hurdle that emerging companies may ever have to face. The company was formally founded in 1980 by Dr. Bert Bunnell to commercialize the Life Pulse High Frequency Ventilator, a new device for assisting the breathing of critically-ill newborn infants. The research efforts which initiated the ventilator's development began in 1972, while Dr. Bunnell was a Research Fellow and Associate in Pediatrics at Massachusetts General Hospital and the Harvard School of Medicine. Over the years, Bunnell has suffered a myriad of setbacks including a heated battle with the federal Food and Drug Administration (FDA). However, the company's prospects skyrocketed when it finally received FDA approval for its high frequency ventilator in June 1988.

Many of the problems between the company and the FDA were due to unique differences between Bunnell's product and currently used conventional ventilators. The latter depend on relatively high pressures which can cause fatal complications such as bursting the fragile air sacs of an infant's lungs and straining the infant's heart. Blood pressure is elevated due to this strain and brain hemorrhaging frequently follows. The Life Pulse High Frequency Ventilator corrects this fault by delivering oxygen using low pressure jets of oxygen-rich air delivered at rates as high as 11 breaths per second.

The major criticism of Bunnell's FDA application was the lack of a control group for comparison with treated patients. Dr. Bunnell and his physician collaborators chose to apply the Life Pulse to those infants who represented the most difficult challenge in the field of newborn intensive care. These patients were premature infants whose treatment with conventional ventilators had produced lung damage sufficient to place them in immediate danger of dying. Dr. Bunnell and his colleagues felt that a controlled study in this patient population would be tantamount to a death sentence for those infants who were randomized to the control group.

With nearly a hundred infants treated by the end of 1985, Dr. Bunnell submitted a lengthy application to the FDA for approval of the device. It was rejected and a three-year battle for approval ensued. What began as a battle ended in cooperation as Bunnell, his physician investigators, and a handful of key FDA staffers put together thousands of pages of evidence from an expanded group of 200 desperately-ill infants that the product was both safe and effective. By the time FDA approval was finally granted on June 30, 1988, the company was deeply in debt, Dr. Bunnell had gone three years without a salary, and the company's industrial backer had lost interest.

With exactly half of the original 200 infants as living testimony to the value of the Life Pulse, 20 hospitals who paid Bunnell to keep the equipment coming, and almost daily calls from other hospitals all over the world who had heard or read of the success of Bunnell's new ventilator, Dr. Bunnell and a score of faithful employees were able to dig themselves out of their financial hole. By June, 1989, Bunnell had regained the marketing and manufacturing rights to all of its products and paid off its debts. Dr. Bunnell has spent years doing research and testing, and millions of dollars to reach the milestone of commercializing his high frequency ventilator.

History of Bunnell's Founding

Dr. Bunnell began this work in 1972. After spending several years in academia, he left in 1975 to design medical products for Air Products and Chemicals, Inc. in Allentown, Pennsylvania. Two years later, the company decided not to pursue this line of research and cut off the research funds. At the same time, Dr. Bunnell received a call from a friend who needed an expert in pulmonary physiology. In 1977 he moved to Utah and went to work for this company, Hospal Medical Corporation. Dr. Bunnell continued his research and development on high frequency ventilation with Hospal until 1980. With a prototype nearly ready for clinical trials the company decided not to commercialize the product, and Dr. Bunnell left to form Bunnell Incorporated.

Bunnell Incorporated was founded with the help of the University of Utah's Innovation Center, a project funded by the National Science Foundation for the purpose of stimulating new high tech industries. With the help of the Center and funds invested by family, friends, and a few doctors and engineers who believed in Dr. Bunnell's work, Bunnell began clinical trials with several prototype high frequency ventilators at five key medical centers around the U.S. in 1982.

By 1982, most of the development work for the Life Pulse was completed. Within two years, FDA approval was the only missing component. In 1985 the company submitted the results from its clinical trials to the FDA. One reason for the FDA's initial refusal to approve the ventilator was the fact that the FDA did not understand the technology of the ventilator or its uses. Dr. Bunnell had to educate the FDA investigators; a problem that was exacerbated by the a high turnover rate at the agency. Eventually, the FDA recognized Dr. Bunnell's position, but only after the company had incurred huge expenses.

Funding

Bunnell, Inc. has experienced the financial highs and lows common to high tech companies. Unlike other high tech companies, however, as a medical company, Bunnell has made an incredible investment in research and testing. The company has invested over $2 million to develop the ventilator. From the date of incorporation, it took over eight years to develop, test, and finally gain FDA approval for the product.

When Dr. Bunnell launched his company he did not have extensive capital resources or financial backing. His first step was to associate with the Utah Innovation Center. In exchange for 30 percent equity in the company, the Center provided an office, a laboratory for his research, administrative assistance and business advice. On a limited scale, the Utah Innovation Center acted as an incubator for Bunnell.

The second important financial event for the company was the development of a spin-off product, the Ventilator Monitor. This device is a computerized monitor for patients on life support equipment. Sales were robust in 1982 and 1983 at $316,000 and $583,000, respectively. However, research costs continued to absorb revenues as the clinical trials of the high frequency ventilator blossomed. For the same two years, the firm reported R & D expenditures of $253,000 and $332,000. In 1984, sales dropped because of distribution problems and the company was stuck with excess inventory.

The company's third crucial step was its association with a major medical company which was currently involved in the manufacturing and selling disposal medical supplies. This company was interested in manufacturing disposable supplies for Bunnell's Life Pulse High Frequency Ventilator and in marketing all of Bunnell's products. It was also willing to play the role of venture capitalist for Bunnell in order to broaden its product base.

The major company purchased 12 percent of Bunnell Incorporated and, as part of the purchase agreement, guaranteed a line of credit for three years. This arrangement allowed Bunnell to continue its research. In addition to providing dollars, Bunnell's corporate partner attempted to market the ventilator product for investigational purposes; however, this attempt was not successful. Constraints imposed by the FDA on selling un-approved devices were just too difficult for the larger corporation to handle. By 1986, it was ready to change directions and wanted out of the equipment business.

Sales dropped to $110,000 in 1986—the lowest level in five years. At the same time, because of the costs associated with gaining FDA approval, the company's R&D expenses continued to drain its revenues.

Despite these financial problems the company survived 1986 by regaining its marketing rights from its corporate investor. Sales climbed to $419,000 in 1987 and for the first time in many years R&D costs declined. The surge in sales reflects the success Bunnell had in selling the Life Pulse Ventilator to hospitals which were testing the device under FDA approved protocols.

Product sales rose to $902,000 in 1988 as a consequence of its FDA approval for the Life Pulse at the end of June. Bunnell also realized a small profit for the first time in the company's history. Based on company projections, sales will skyrocket to $2.8 million in 1989, and $5.83 million by 1990. To meet these objectives the company is raising new investment capital which will allow the introduction of Bunnell's new products for pediatric and adult intensive care and anesthesia markets in 1990 and 1991. These new products will broaden the firm's product line and solidify its position in its medical market niche. At some point in the next few years, the company plans to issue an initial public offering.

Products

Bunnell's primary product is the Life Pulse High Frequency Ventilator. At a cost of $23,900 per ventilator, the Life Pulse is over twice the price of a conventional ventilator, and generates very attractive gross margins. Bunnell is also developing a model which can be used by adult patients. The only major development left for completion of this model is the design and fabrication of injection molds for scaled-up disposable humidification chambers. Successful preliminary clinical trials of the adult model have already been conducted at one hospital.

In retrospect, Dr. Bunnell concedes he was far too optimistic regarding the intricacies of obtaining FDA approval. He consistently underestimated the time and expense. Initially, he expected approval within one year. After the first year passed, and then the second, he thought approval had to be around the corner. It was not. Fortunately, since the adult model ventilator uses the same software and hardware

as the infant model, it is expected that FDA approval will not be as difficult to obtain.

A related product, the Ventilator Monitor, was spun off the development of the Life Pulse in 1982. The Monitor is designed to measure the pressure delivered to the lungs of patients who are being supported by conventional ventilators. It also alerts the nursing staff of any irregularities in ventilator pressure or rate fluctuations that may be hazardous to the patient. Bunnell has sold over 1,200 of its Ventilator Monitors since 1982. Revenues from this product helped to sustain the company in its early years. The company plans to develop an improved monitor in the next few years. This new monitor will serve as an accessory to clinicians using the Life Pulse.

Bunnell recently began manufacturing and distributing the disposable supplies for its Life Pulse High Frequency Ventilator. These humidifier cartridges and tubing sets presently sell for $78 and last for up to five days before they must be discarded. As the installed base of Life Pulse Ventilators increases, these supplies will provide a more and more significant contribution to Bunnell's revenues. Bunnell also makes and resells various support accessories for its ventilator and monitor such as a cart, mounting brackets, an uninterruptible power supply, and an air/oxygen blender.

Other products expected to be developed by Bunnell will revolve around the care of critically ill infants and adults. The market for conventional ventilators is at least as large as that for high frequency ventilators, and the company has gained an excellent reputation in this field for its innovative abilities and customer service.

Market Potential

Dr. Bunnell estimates that the market for his high frequency ventilator is substantial. There are approximately 750 newborn intensive care units (NICUs) with 10,000 beds in the U.S. It is estimated that one high frequency ventilator will be required for every six NICU beds (1,667) and that the number of NICU beds will continue to grow at 5 percent every year through 1993.

Approximately 10 times as many intensive care units for adults are in use (7,500) with 8.5 times as many beds (85,000). There are also 2,000 cardiac care and 400 pediatric intensive care units in the U.S. now with 16,000 and 3,200 beds, respectively. The applications for high frequency ventilation would account for at least one unit for every 12 beds in each of these settings.

In evaluating market potential for Bunnell's products, two considerations are very important. The first and perhaps most important is the proprietary position of the company. Bunnell has four patents protecting the crucial aspects of the Life Pulse. One patent protects the all important jet valve and its location near the patient's head. The position of the jet valves results in crisp, undamped gas pulse delivery. In effect, the company feels that this gives Life Pulse a considerable competitive edge and extends the market opportunity of the device.

Market opportunity is the second important consideration. The company believes the high frequency ventilation will be widely accepted because it is a superior technique. Bunnell's competitors were recently crippled in this market by the results of a National Institutes of Health study which revealed that high frequency oscillation is associated with a significantly higher incidence of brain and lung damage. All of Bunnell's principal competitors use high frequency oscillation in contrast to the high frequency jet ventilation used by Bunnell. These firms must satisfy FDA's claims that their devices do not cause an increase in these adverse side effects.

Bunnell has invested a great deal of time and money into the development of its ventilator. These expenses combined with the company's patents, and the adverse findings of the FDA should allow Bunnell to dominate the market for at least four years.

Management and Employment

Dr. J. Bert Bunnell, the founder of the company, serves as its President and CEO. Dr. Bunnell graduated from the University of Utah and received a doctorate degree from M.I.T. in chemical engineering. Prior to founding Bunnell, Inc. he had worked in high frequency ventilator research as an academic and later as a researcher with two private companies. However, he did not have any business or finance experience; both skills were acquired through "on-the-job-training", although he did receive some assistance from the Utah Innovation Center. Until recently, Dr. Bunnell was responsible for all the management and financial activities of the company.

Ping Fong joined Bunnell in 1989. He is Vice President and General Manager which covers all company functions except research and development and marketing. He and Dr. Bunnell worked together previously at Air Products and Chemicals, Inc. Mr. Fong has an M.S. in mechanical engineering, an M.B.A., and has considerable management experience in both large and small companies.

Roger Atkins has worked with Dr. Bunnell since 1979 in various capacities, and is presently directing the company's research and development activities. Mr. Atkins has made significant contributions to the frequency ventilator, designed and developed the humidification system for both the Life Pulse and the

Infant Full-Feature Ventilator and responded to the technical requirements of the FDA approval process for the Life Pulse. He also has extensive experience in computer software designs and was one of the primary contributors to the electronic design of the Life Pulse.

Twenty people presently work at Bunnell, Inc. Several years ago the company employed 24 workers, but financial strains forced many people to leave. In retrospect, Dr. Bunnell feels the company employed too many people for a firm that was not focused and too research-oriented. At the present time, only 4 of the 20 employees are involved in development activities. Dr. Bunnell projects that a total of 25 people will be employed by the end of 1989. Five will be involved in development and 20 in marketing, administration and finance. The company has not had any problem finding qualified workers in Utah.

Utah: An Executive Opinion

Chance played an important role in the company's Utah location even though Dr. Bunnell is a native of the state. When he left Hospal Medical Corporation, Dr. Wayne Brown, a Utah entrepreneur was extremely supportive of Dr. Bunnell's decision to start his own company. Dr. Brown lent his time and effort to making Bunnell, Inc. a successful operation. Unfortunately, a tragic accident claimed Dr. Brown's life in 1988.

It is Dr. Bunnell's opinion that Utah offers many advantages for his company. Leading the list is the company's relationship with the University of Utah and Primary Children's and LDS Hospitals. The company has been able to attract several university graduates and the hospitals have provided an environment where Bunnell's products could be tested.

It is not surprising that after eight years of financial struggle, Dr. Bunnell has very strong opinions regarding Utah's venture and banking communities. According to him, there is too little venture capital in the state. Moreover, the few resources that are available are controlled by too few investors. Utah needs to develop its venture capital resources. With respect to the banking community, Dr. Bunnell feels they are far too conservative and do not understand the needs of small high tech companies like his own.

Dr. Bunnell's final observation deals with the lack of managerial and marketing professionals in the local market. It is very difficult to entice a potential manager to join a struggling high tech company, even if he or she believes in the company. Not only is there a lack of marketing and managerial expertise, there is also a lack of entrepreneurial spirit among those types of people who live in the area.

Recently, an out-of-state development agency offered to arrange a package of financial incentives for Bunnell, Inc. if the company would relocate. Dr. Bunnell is weighing the pros and cons of such a move. One strong enticement is the offer to finance the company's expansion. Given the promising future of Bunnell, Inc., it would be a great loss for Utah if the company relocated.

Bonneville Scientific

Background

Founded in April 1981 by Allen R. Grahn (current president) and Lynn Astle, Bonneville Scientific is a small company that specializes in the research and development of sensor technology for robots. The company was established with funds from a Small Business Innovative Research (SBIR) Phase I grant to study the feasibility of using ultrasonic radiation to separate proteins. Funding for Bonneville's research has come primarily from the federal SBIR program. The company has received more SBIR grants under this federal program than any other company in the state. Bonneville has successfully blended research and product development, and is beginning to custom manufacture tactile sensor systems. In addition, this Salt Lake City-based firm is expanding its potential by spinning off a new high technology company which promises to expand this company's horizon.

Products

The company has developed two products related to sensor technology. The first product is the tactile sensor. The basic principle of operation of the tactile sensor is an ultrasonic pulse-echo ranging that generates an image of the surface of an elastomeric pad located on the gripping surface of a robotic end-effector. As the robot grasps an object (a cylinder, for example) the elastomeric pad conforms to the surface of the object and is compressed. An array of transducer elements measure the compression of the elastomer which is proportional to the normal force applied to the pad. The distribution of these force measurements is used to create a composite force/shape "tactile image" of the cylinder.

The tactile sensor represents an important breakthrough in the use of robot sensor technology. A major advantage of this sensory technique is the

measurement of time intervals rather than signal amplitudes. All other tactile technologies rely upon the measurement of the amplitude of some response. Because of elemental variation each element is usually individually calibrated. With this technology, as long as the signal is large enough to be detected, the signal amplitude is unimportant, and calibration is not necessary. This greatly improves the reliability of the tactile sensor, and reduces the cost of use by increasing the efficiency.

The second device developed by Bonneville Scientific is the force-torque sensor. This device is designed to measure all six orthogonal force and torque components. With further development, the force-torque will be small enough to be mounted upon the gripping surface of a robot end-effector. The sensor consists of an elastomeric spring element joining two parallel plates. Ultrasonic pulse-echo ranging is used to detect fine movements of one plate relative to the other. This position information is utilized to measure and resolve the six force and torque components. This project is being supported by an SBIR contract from NASA.

One way to illustrate the usefulness of the force-torque sensor is to imagine a conveyer belt carrying parts that will be assembled by a robot. Normally, if one part is not positioned correctly on the belt the robot sensor will not be able to pick up the part and assemble it. With the force-torque the sensor recognizes the part is not positioned correctly, and makes the necessary adjustments. In essence, the force-torque sensor is a "smart device" that is, the sensor can make automatic adjustments. The development of this sensor system was initially supported by SBIR grants from the National Science Foundation and the Department of Energy.

Funding

As mentioned before, the start-up funds for Bonneville Scientific came in 1981 from an SBIR Phase I grant to study the feasibility of using ultrasonic radiation to separate proteins. Although the research was not successful, Bonneville won another SBIR grant soon after, which kept the company operating. After 18 months, the company won a Phase II SBIR grant to continue its research on robotic-touch sensors. The founders readily admit that without the SBIR program Bonneville Scientific would not have been started. Bonneville has been uncommonly successful in attracting such grants. To date, the company has received a total of 16 SBIR's from the following agencies: National Science Foundation (8), Department of Energy (3), NASA (3), National Institutes of Health (1), and U.S. Navy (1).

The company has also received research monies from the Utah Technology Finance Corporation. In 1988, the company was funded for over $600,000 and over the past four years has spent more than $2 million for research. In essence, the SBIR program has acted as a venture capitalist for Bonneville Scientific by providing capital and development opportunities.

At the present time, Bonneville Scientific is a candidate for venture capital. The company's principal thrust is research and as such, it lacks the market potential to attract investment capital. While Bonneville has several proprietary products which may offer market opportunity in the future, commercialization is still years away.

Market Potential

Its research orientation is not the only concern for Bonneville. Another problem is the nature of the research. Ten years ago, robotics was the wave of the future. Manufacturers rushed to develop robotics as a way to reduce labor costs in an inflationary economy. However, when inflation slowed, the wage spiral was broken and with it the main impetus for robotics. Since 1982, demand for robotics in manufacturing has declined significantly. Undoubtedly, this trend will reverse itself. The use of robotics is an effective way to reduce labor costs and improve efficiency.

Management recognizes the problem of relying on just research and having a specialty which is not in vogue. In an attempt to broaden the firm's potential, Bonneville Scientific is forming a new high tech firm with the University of Utah. The University owns the technology which is the foundation of the new company called Bonneville Microelectronics and will retain an equity position. Bonneville Microelectronics will specialize in integrated circuits. The objective in forming another entity is to use it as a cash provider for supporting the longer term robotic products. The founders realize that the market window for Bonneville Microelectronics is narrow and that its product life cycle is short. Nevertheless, the goal is to take advantage of current demand while creating sales revenue at the same time.

Preliminary interest has been strong and the company started marketing the product several months ago. Based on initial sales, the company expects to realize between $5 to $10 million in sales within a few years.

Management and Employment

Dr. Allen R. Grahn is President and founder of Bonneville Scientific and oversees the company's research activities. He is also the principal investigator for NSF grants on acoustic protein separation and robotic force sensor arrays and VLSI implementation of an image segmentation algorithm. He has been associated with the University of Utah as well as the

UBTL Division of the University of Utah Research Institute. Dr. Grahn is a well recognized authority in his specialty and has many articles dealing with ultrasound and remote sensing.

The daily business operations (administration, finance and personnel) are handled by Dr. Lynn Astle. His research experience includes positions with the Department of Medical Technology at the University of Utah, UBTL Division, and Research Institute.

The company's employment level varies with its research contracts. Currently, the firm employs 10 people, eight of whom are researchers. The company has filled its research positions with people from the Salt Lake area. Based on his experience, Dr. Astle believes there is a surplus of fine researchers. In one instance, the firm advertized for a part-time researcher and received 75 applications from qualified people in the Salt Lake area.

Because the firm is small and research-oriented, project leaders manage the work flow and Dr. Astle manages the operations. The two most important tasks of the company are: (1) to produce quality research on schedule at budget and (2) to develop its sensor products. Both Dr. Astle and Dr. Grahn are involved in every research project.

Utah: An Executive Opinion

The founders of Bonneville Scientific love Utah and have gone to extraordinary lengths to remain in the state. They feel their relationship with the University of Utah has been extremely rewarding as well as instrumental to their continued success. Both founders have served as faculty members at the University and rely on the school to provide researchers. Dr. Astle goes so far as to say that without the University of Utah there would be no Bonneville Scientific.

In addition to a supportive university, Bonneville's CEO feels that the labor market in Utah is excellent. The company is able to hire qualified researchers at very reasonable wages and salaries. Many of the researchers, as well as the founders, are willing to accept a lower salary because of the quality of life offered in Utah.

The only negative mentioned by the CEO is the banking community. Bonneville has had difficulty establishing a long-term relationship with a lender. Dr. Astle admits, however, that his company is fiscally conservative and this may have limited the type of services needed from a lender.

CardioPulmonics, Inc.

Background

CardioPulmonics, Inc. is an emerging medical company founded by Dr. J. D. Mortensen, a senior cardiovascular surgeon at the University of Utah Hospital, and Larry Rigby, an experienced entrepreneur in the health care field. The company was formally established in April 1985 after Dr. Mortensen completed a SBIR Phase I grant. It was this initial research which launched the partnership and CardioPulmonics. In September 1985, the firm received a SBIR Phase II grant for $500,000 to continue the original research. Based on this second stage research, CardioPulmonics developed its first product—an intravascular oxygenator (IVOX), and has since developed several other related products—an extravascular oxygenator (EVOX) and a portable heart/lung machine.

Products

CardioPulmonics has developed a blood gas exchange device (artificial lung) and other cardiovascular technologies. Based on these core technologies, the company is currently developing a temporary, intravascular oxygenator (IVOX) designed to be used on certain acutely-ill patients in the intensive care units of hospitals.

The IVOX is an intravenous blood gas exchange device to permit adding oxygen to, and removing carbon dioxide from, circulating blood in patients with advanced respiratory failure. This small, state-of-the-art membrane oxygenator makes use of a highly sophisticated membrane and device design technology. IVOX is inserted like a catheter into the patient's vena cava (venous) system for temporary respirator support of assistance (up to 10 days).

The initial clinical tests were completed in 1986 and a patent was granted in April for that year. The company is now preparing to begin human clinical trials necessary for FDA approval. This approval for IVOX is expected by 1990, at which time production and marketing of the device can begin.

The second major product under development is a spin-off of IVOX. EVOX is a long term, extravascular oxygenator which operates in the same manner as IVOX except that it will be used by the patient for longer periods of time.

A portable heart/lung machine (MEHEALUS) is the third product being developed at CardioPulmonics. This device will function as a portable, semi-automatic emergency-like support system to achieve physiologic stability and maintain vital organ viability of patients

in acute, severe, and potentially reversible cardiopulmonary failure. One of the key components of this system incorporates the core membrane technology developed for IVOX. A broad patent for this technology was granted in September 1986.

While the testing and development of IVOX is farther along than the other products, the company is attempting to keep EVOX and MEHEALUS on the development track. However, since the technology used to develop IVOX is the core technology for spin-off products, the company's objective is to proceed as quickly as possible to achieve final approval for IVOX.

Funding

A Phase I SBIR grant funded the initial research that is now the cornerstone of CardioPulmonics' technologies. Based upon the favorable results of this research, Dr. Mortensen and Larry Rigby entered into a partnership whereby each contributed seed capital. CardioPulmonics won a Phase II SBIR grant for $500,000 to continue the original research. In 1986, the firm received a capital infusion of $200,000 from the Utah Ventures (a Utah-based venture capital company). This commitment was important for two reasons: first, the capital helped fund the start-up costs; and second, the investment helped attract other venture investors.

In 1987, the firm entered the big leagues of venture investment. With Montgomery Medical Ventures acting as the lead investor, Columbine Ventures and Alan Patricof Associates joined forces and invested $2 million. The company also received $50,000 from the state of Utah in 1987 that was used to research aspects of the company's membrane development thrust. In March 1988, the company received an additional Phase I SBIR grant from the National Institutes of Health.

The firm has successfully mixed grant and investor capital to meet its revenue needs; and those needs are significant. An unofficial estimate is that venture capitalists will invest approximately $5 million before the IVOX device is introduced to market. The firm does not yet have a marketable product because it needs the FDA's approval. It may be another two years before it is able to sell IVOX and perhaps 1991 until the other products are on line. To realize this goal, Larry Rigby feels the company will need between $3 and $6 million. Although some of that may come from additional SBIR grants, the majority must come from venture capital or other corporate sources.

The strength of the CardioPulmonics management team explains the company's success in attracting capital. Larry Rigby is an entrepreneur with experience in managing small medical start-up companies. He has taken Dr. Mortensen's research product and developed a company. For his part, Dr. Mortensen is widely recognized as a leader and innovator in the firm's specialty.

Market Potential

The three interrelated products which have been selected for development have tremendous market potential. For example, IVOX and EVOX have an estimated U.S. market potential of $400 million. MEHEALUS has an estimated U.S. market potential of $43 million for disposables and an additional $50 million for hardware. A patent with broad protection for IVOX was granted in April 1986. Additional patent applications are pending.

Management and Employment

Larry Rigby is the President and CEO of CardioPulmonics. His background is in the development and management of start-up companies that specialize in the manufacture and distribution of hospital medical devices and equipment. As an entrepreneur, Mr. Rigby has had experience in the funding of start-up ventures; his experience with venture capital investors has been very important for the firm. He is also involved in three other medical start-up companies, although at the request of his investors at CardioPulmonics, all of his time is now devoted to that company.

Dr. J. D. Mortensen is the Chairman of the Board and Chief Technical Officer of the firm. His research activities led to the creation of CardioPulmonics in 1985. Dr. Mortensen has been on the clinical faculty of the University of Utah's College of Medicine since 1955. As Director of Surgical Research at the UBTL Division of the University of Utah Research Institute, Dr. Mortensen has done extensive work for NIH, FDA, and private companies in the fields of vascular grafts, mechanical cardiopulmonary bypass equipment (heart/ lung machine), ECMO (extracorporeal membrane oxygenation) perfusion, cardiac catheters, cardiac valve prostheses and blood/materials interfaces.

Other researchers and professionals have joined CardioPulmonics in the past three years. Gaylord Berry, Vice President of Development, and Dr. Suzanne Winters, Membrane Project Manager, are specialists in their fields. Because regulatory issues can make or break a company, a regulatory affairs specialist has joined the firm to guide CardioPulmonics through the regulatory maze.

CardioPulmonics also has a scientific advisory board consisting of four well known authorities. This committee advises the firm on technical and research matters related to product development. Presently, CardioPulmonics employs 12 professionals and support

workers plus six part-time workers who are graduate students at the University of Utah. The firm plans to add two more professionals by year-end. With the exception of two clerical workers and the president, everyone at the firm is involved in R&D.

Utah: An Executive Opinion

After having started several companies in Utah, Mr. Rigby has very definite opinions about locating a firm here. Overall, he believes Utah's advantages far outweigh its limitations. Heading his list of advantages is the area's infrastructure. He identified four components of that infrastructure which have helped CardioPulmonics succeed: (1) a strong research University specializing in medical/biomedical research, (2) qualified researchers, (3) low labor costs, and (4) a strong support industry. These types of infrastructure help a young firm control costs and expenses.

Utah's quality of life is also another plus. High tech researchers and managers are attracted to the area and are willing to work for less than national salaries because the recreational opportunities and clean living environment are unparalleled.

Mr. Rigby feels that the dearth of venture capital is hampering Utah's entrepreneurial climate. The lack of local venture capital and investors is the missing link. According to Mr. Rigby, it is a two-way street. Venture capital stimulates entrepreneurial activity, just as entrepreneurial activity stimulates venture investments. Utah has plenty of entrepreneurial opportunity, but no capital; that side of the street is closed. "Why?"

He suggests that one reason may be Utah's "flim-flam image" which discourages outside investment. The lack of stringent security regulations was cited by Mr. Rigby as a contributing factor. Whether or not this observation is justified, Utah is perceived as a financial community where stock manipulations are the norm rather than the exception. Utah needs to deal with this perception if it is to succeed in attracting new venture money.

Mr. Rigby feels the importance of Utah Ventures, the University of Utah and the Utah Innovation Center cannot be understated. Without the support of all three, it is very likely CardioPulmonics would not have emerged as one of the state's possible success stories in high tech development.

Capital Solutions, Inc.

Background

Capital Solutions has had a circuitous business development that spans over 19 years. The genesis of the company began in the late 1970s when Mr. LeRoy Parker developed a computerized accounting and inventory control system designed specifically for glass retailers. In 1980, Mr. Parker started his own company and called his newly developed software system the LePic Auto Glass System. By 1984 the system had been installed in two glass retailing companies—Massa Glass and Jack Morris Auto Glass.

In 1985, all assets of LePic Systems were acquired by Capital Systems, Inc., a micro/mini computer company. Just one year later, Capital Systems was acquired by SHL Systems House of Canada. With SHL providing the long term financing, LePic Systems was acquired by Capital Solutions, a newly formed private corporation founded by Mike St. Claire—former LePic division manager under Capital Systems.

Capital Solutions was incorporated in 1986. While the company has undergone several corporate changes, its primary focus is to support the glass industry generally and the auto glass retailers and wholesalers specifically, by developing and enhancing the original LePic System. Capital Solutions, Inc. is located in Provo, Utah.

Product

The primary product of Capital Solutions is the LePic Glass System. This software operates on a broad range of computers from a small IBM/PC with a single user to a large IBM mainframe. The LePic System is not hardware dependent; however, it can run on AT&T, Fujitsu, Honeywell, NCR, and Unisys along with others. It has the capability to meet the accounting, inventory, and management information needs of the auto glass industry. For example, the LePic Auto Glass System provides complete accounting capability; purchasing capability to track purchase orders and provide an up-to-the-second inventory usage history; management reporting system, producing standard sales, inventory and accounting reports; inventory tracking and control; detailed invoice generation; parts look-up directly by part number and/or indirectly utilizing NAGS catalog; and, on-line capability for instant quotes or work orders for follow-up. From this listing, it is clear that the LePic System provides a full range of capabilities for the auto glass industry. There are two versions of the LePic System which are used by wholesale glass and flat glass businesses. These versions have the same inclusive capabilities as the auto software.

Capital Solutions plans to broaden its basic product line by developing less expensive, lower

capability products which can be sold and serviced on a higher volume basis. C. R. Lawrence, for example, is interested in a low cost subset of the auto glass quoting software which could be sold in volume through their catalog to MS/DOS users. The Glass Industry Purchasing Association has accepted a proposal for a low end automation package that will provide only the very basic capabilities. The last product under development is a retail point-of-sale system. The company plans to focus on the retail office products market. There is an estimated market of 8,000 retailers and virtually no computer penetration at point of sale.

Market Potential

Capital Solutions does not have a diverse product line, nor does the company intend to develop a different line of software. In other words, Capital Solutions is a specialist. The company's marketing strategy is to reach the various market segments within the glass industry by tailoring its basic software package.

The glass industry is made up of five general segments: insurance replacement business (primarily auto sales), wholesale distribution, full service glass business, glass manufacturing, and storefront construction. The first three market segments are being addressed by the firm's present product line. (The auto industry is its best market.) The company plans to penetrate the glass manufacturing and storefront construction business markets because the LePic System is fully adaptable to these segments. The issue is simply one of marketing. The firm plans to reach these markets by forming joint ventures with other firms which are now active in these segments. The attraction for the active firms is the superiority of the LePic System. The company's primary objective is to become the dominant computer system supplier to the retail/wholesale glass industry in all five segments. The firm is aiming for a 12 percent market penetration in the domestic market and gross sales of over $20 million by 1991.

Funding

The financing for Capital Solutions was a combination of bootstrap and debt financing. Mike St. Claire provided part of the start-up capital, and SHL Systems House provided the long term debt used to secure the initial assets (namely the accounting system software). To date, the company's internal operations have been funded by cash flow from sales revenues.

Sales

A minimum-size complete system presently sells for about $10,000 with the average sale running about $30,000. To date, the company's largest sale to a single customer was approximately $250,000. The company estimates that the market potential for its existing and expanded products is $260 million. International sales, especially to Canada, Australia, New Zealand and Europe, also provide an enormous market because the international glass industry in these areas operates much like the U.S. market.

In 1986, the company realized $732,000 in sales and preliminary figures for 1987 show revenues totaling $1.3 million. The company hopes 1988 will be a banner year with $3.5 million in revenues.

Management and Employment

In 1987 the company employed 12 people. Six of Capital Solution's employees are members of the company's management team.

Capital Solutions was purchased from SHL Systems House by Mike St. Claire—a former division manager for LePic Systems. Under the buyout agreement, SHL provided the long-term financing for the purchase by carrying back a note payable. Mr. St. Claire is the president of the company and has over 19 years experience in the computer industry with a business background including applications programming, systems programming, system design, communications, hardware/software evaluation and procurement and management.

John Wharton is the Vice President and Technical Director of Capital Solutions and is responsible for product development. He also serves as Controller, overseeing the company's accounting system. He has over eight years experience in the computer industry and served as controller for a large lumber company in California. Allen Langford is Product Manager responsible for development and marketing efforts for a product that the company is developing with Mr. Langford's company.

Utah: An Executive Opinion

Mr. St. Claire feels that Utah is an excellent location for his company. The productivity of the labor force is one benefit he identified. However, being located here poses a problem for small companies that are trying to raise capital. Capital Solutions is currently looking for $750,000. Mr. St. Claire feels his company must look outside the state for this money.

Epilogue

In July 1988, Capital Solutions ceased business operations. In discussions with former employees, it was clear that several key events occurred which adversely affected the company's ability to remain an ongoing concern. Prior to the date specified by SHL for the first installment due from Capital Solutions, Mike St. Claire wrote and requested an extension.

SHL refused, and called the note due. However, the company was experiencing severe financial problems even before this. According to a former employee, management was an important factor in the company's failure.

The company's labor force was too large to support with the existing customer base. In order to meet payroll, the company had to sell two to three large systems each month. When the marketing team failed to meet this goal, financial problems ensued.

At the point Capital Solutions went out of business, some employees had not been paid for several periods. However, management was hesitant to lay off employees, even when it was obvious that some were not performing. The company was also heavily in debt, a situation that precluded any additional investment financing. Complicating this problem was the fact that the company's market niche was extremely narrow, and would not offer a venture investor the rate of return necessary to make the investment worthwhile.

Clyde, Inc.

Background

With the help of his two sons, Robert and Steven Clyde, Alan Clyde developed the company's basic product line nearly eight years ago. Mr. Clyde was a typical technical entrepreneur with a strong technical background (which was enhanced by the technical creativity of his sons), and a vision and determination necessary to begin a company on a shoestring. After a fast start, the company's growth stalled and Al Clyde had to look for money outside his organization in order to survive. In 1982, investor financing was obtained and within a short period Alan Clyde was forced out of the organization. In 1986, David Bailey (an experienced high tech executive and founder of Iomega) joined the firm on a temporary basis and a search began for a qualified, experienced manager. In April 1988, the company hired Jim Murdakes as president and CEO. Since 1981, Clyde, Inc. has grown from a family organization to a professionally-managed company that is a leading developer of innovative software in the areas of computer security, system support utilities, communication software, and productivity tools.

Products

Clyde, Inc. has two distinct product groups that represent divisions within the company. Security and Support products are the company's mainstay. The second product, ProCODE, is currently in three beta test sites. Clyde's products appeal to four separate markets—System Security, Support and Training, Communications, and Computer-Aided Software Engineering.

Clyde entered the computer security market in 1985 with the introduction of ClydeSENTRY. This software program protects dial-in lines from unauthorized users by requiring dial-in users to enter an ID code. The program hangs up the line and then redials the user at a pre-determined number before the user can access a particular program. ClydeSENTRY also has the ability to limit the menus a user can access and can secure logged-in terminals while users are temporarily away from their stations.

Clyde's System Support and Communications products provide a variety of systems management functions that improve the functionality and usability of the computer. Products include INSTRUCTOR, ATTEND, CONTRL, CALOUT-Plus, and ProMAIL.

INSTRUCTOR and ATTEND: INSTRUCTOR can be used to demonstrate software on several terminals at one time. With the optional ATTEND module, students can connect their terminals to the instructor's at any time during a demonstration and send a signal if they have questions. Answers can be sent from the instructor's keyboard.

CONTRL: CONTRL allows a supervisor to connect his or her terminal to any other user's terminal to show on the terminal screen (rather than attempt to explain) a particular idea or activity. Both users see the same thing on the terminal screen, and both can enter data from the keyboard.

CALOUT-Plus: Large organizations have geographically distributed computer resources, and must solve the problem of communicating between their various computer sites. CALOUT-Plus provides the ability to link to any site and allows the exchange of data between sites. CALOUT-plus can be automated so that this exchange can proceed unattended.

ProMAIL: ProMAIL provides automated electronic mail transmission between VMS Mail and EasyLink network without human intervention. In April 1989, Clyde private-labeled ProMAIL to Western Union and will no longer sell this product. These system support products sell for $2,000 to $16,000 depending on system model and configuration.

Also in April 1989, the company signed a non-exclusive agreement with Hamilton-Avnet to sell Clyde Security and Support products in Canada. This is an important milestone as Hamilton-Avnet is a major

distributor of Digital Equipment Corporation's products. Clyde's products are compatible with this system.

The second product family includes ProCODE. This is a software innovation that can be used in the Computer-Aided Software Engineering (CASE) market. It incorporates leading edge technology for automating the programming of application software. The company hopes to have version 2.5 of ProCODE in six beta test sites by June 1989, although ProCODE is still in a research and development phase. This version will generate code in VAX BASIC for applications that access RMS and Rdb/VMS data files. Future versions will support graphics, SQL, additional language options such as COBOL, and will multiply hardware and operating systems such as UNIX and MS/DOS.

Funding

Clyde Digital, Inc. (the original company) was a bootstrap endeavor. Mr. Clyde provided the initial financing for the venture. Although initial market acceptance of Clyde's product was encouraging, additional capital was needed. Utah Ventures, a Utah-based venture capital company, provided Clyde with $200,000. This small investment attracted additional venture money for a total investment of $2.8 million. The company has also raised money by issuing stock in lieu of cash payment for services, and by selling common stock to investors through a private placement to offset operational deficits.

According to Jim Murdakes, the company needs at least $5 million to finish ProCODE development. High development costs and sales and marketing expenses have resulted in three consecutive years of before-tax losses, totaling $1.48 million. The culprit has been the development costs associated with ProCODE. At present, ProCODE development costs are averaging $130,000 per month with no revenue offset, causing financial concerns for the company.

Sales

Despite three consecutive years of losses, Clyde has managed to keep the doors open and in August 1988, the company made money for the first time since its inception. Although the company suffered a small setback in the first quarter of 1989, Mr. Murdakes feels it will again be profitable by the end of 1989. Clyde had sales of $1 million in 1986; $2.2 million in 1987; and $2.8 million in 1988.

Market Potential

The market for Clyde's products is tied to the installed base of VAX/VMS general purpose computers manufactured by Digital Equipment Corporation. Computer Intelligence Corporation estimated that there were over 93,000 installed sites with more than 132,000 VAX/VMS CPU's in the field by the end of 1988. This number is expected to rise to over 420,000 by 1992. The market expansion of DEC's VAX/VMS systems will provide an ever-increasing market for Clyde's product lines. The market for the security systems product alone is expected to reach $12 billion by 1995 (Electronics Industries Association).

Management and Employment

In April 1988, Jim Murdakes assumed the positions of President and CEO. Prior to joining Clyde, Inc., Mr. Murdakes spent 25 years in various management positions with Control Data Corporation (12 of which were spent as Vice President, responsible for marketing the company's computer systems worldwide). The original founder is no longer involved in the company's operations, although his sons hold positions in the company (Robert Clyde is Vice President, directing product development, and Steven Clyde is the principal engineer for new technologies.)

The lack of a well-defined sales and marketing strategy, combined with poor management kept Clyde Digital from realizing its potential. Under Jim Murdakes' management, sales and marketing were given top priority. Under the salary structure developed by previous management, the marketing and direct sales efforts were not generating sufficient income. Mr. Murdakes felt that the lack of sales was tied to the unusually high base compensation for direct sales personnel. There was simply not enough incentive to sell. In addition, the skewed compensation structure for direct sales personnel was affecting the efforts of the telemarketing division. One of the first steps of the new CEO was to redefine the compensation package for the direct sales force so that sales results matched income. Base salaries were reduced, while commissions were increased.

The management structure of Clyde is separated by function; that is, there are two main divisions, R&D and marketing. The R&D division employs 23 people, mostly technical staff; the marketing division employs 20 people. The managers of both divisions report directly to the CEO. Administrative services such as accounting, personnel and finance employ 12 people, and is managed by the CEO.

Presently, Clyde employs 67 people; if all goes according to plan, the company will employ 85 people by the end of 1989. New workers will most likely join the marketing division. The company expects to fill these positions with local workers. Telemarketing is an important sales technique for Clyde. The sales force is made up of both part-time individuals who are paid an hourly wage with a strong commission incentive and full-time, entry level salespeople.

Utah: An Executive Opinion

Jim Murdakes, president and CEC, came to Utah from Minnesota and brings with him a fresh perspective concerning Utah as a high tech center and as a place to live. He likes Utah and feels it provides a pleasant working environment. However, he also indicated that he has had problems motivating the local work force. Some of his top people, and a good number of his top producers have been recruited from outside the state. In his opinion, finding qualified, motivated people in Utah is a challenge.

Globesat, Inc.

Background

Globesat was formally established in 1984 and is a spin-off of the atmospheric and space research being undertaken at Utah State University. Founded by Dr. L. Rex Megill, with financial assistance from Dr. Wayne Brown and Don Stringham, the company's objective was to manufacture and market small satellites that could be used to transfer data between low earth orbits and ground stations. Since then, the company has undergone several corporate changes.

In 1987, Globesat completed a merger with a publicly-held corporation. More recently the company acquired another Utah firm in order to enhance its production capability. Although the company has been through a myriad of changes, the development and manufacture of earth satellites for commercial and government customers continues to be the company's main thrust. The company has also developed related products or subsystems which can be marketed separately. The company is located in Logan, Utah, near Utah State University.

Products

Globesat was incorporated in 1984 for the purpose of manufacturing spacecraft to be carried into orbit by the Space Shuttle and by expendable launch vehicles to supply location, communication, earth observation and data relay services to a wide variety of private and government customers. Globesat manufactures two commercial satellites, the GS 100 and GS 200. The GS 100 model is the direct descendant of the Get Away Special Satellites. The original satellites launched from the Shuttle, NUSAT and GLOMR were forced to assume an essentially spherical shape because of safety concerns. However, the GS 100 is built in the shape of a right octagonal cylinder. This shape allows compatibility with either the Shuttle extended canister or with a variety of other launch mechanisms, including the Orbital Express.

The standard GS 100 model includes the command and control computer equipped with two megabytes of memory, a complete power system (including batteries and solar cells with redundant capabilities) an orientation measurement system and the structure. The command and control computer comes with multitasking software and all other software required for satellite operation, including housekeeping and unlinking of new command programs as needed.

The GS 200 is a larger version of the GS 100. This satellite carries all the subsystems offered in the GS 100 plus a power system which has double the capacity. The GS 200 was developed because of the need of many experimenters for larger satellites.

In addition to the GS 100 and GS 200 satellites, Globesat has developed power, control, and orientation sensing subsystems. Each of these subsystems has a commercial potential independent of satellite application. The power system, for example, utilizes solar cells to produce the necessary power for the satellite. This technology can be used in other ways.

Funding

Globesat was initially financed through an R&D partnership (Dr. Wayne Brown and Don Stringham were the financial partners in this funding vehicle). This partnership raised approximately $350,000 for the fledgling firm. Utah State University also provided, on a limited basis, some incubation facilities. Since 1984, the company has used a variety of sources to meet its capital requirements. Globesat has been able to raise nearly $750,000 in contracts from different state and federal agencies. However, the company's capital needs have exceeded this amount and in 1987, Globesat merged with Sure Investment Company—a publicly-traded company later renamed Globesat Holding Company. A private placement through the holding company brought in approximately $500,000 of working capital for Globesat. Recently, Globesat acquired another company. This move helped the company raise much needed capital and at the same time, increase its existing production capability. Presently, Globesat is looking for a venture partner in order to secure additional financing.

Market Potential

Globesat has targeted the low-cost end of the satellite industry as its specialty. Initial plans were to launch these satellites during shuttle missions by ejecting them from National Aeronautics and Space Administration Get Away Special self-contained payload carriers in the shuttle's cargo bay. With the shuttle fleet grounded following the Challenger

accident, the company has been forced to consider using expendable launch vehicles. Without question, the Challenger accident was a major setback for Globesat. The accident closed the door on Globesat until shuttle flights resumed. Alternative delivery systems are not feasible because costs for expendable vehicles are much higher than for shuttle-borne launches. In response, Globesat has developed a multiple satellite device which permits accommodation of ten or more sateilites by a single launch vehicle. However, in evaluating the company's market potential, it should be remembered that there is a high demand for low cost satellites.

One very promising application of a satellite manufactured by Globesat is a "store-and-forward" function. A store-and-forward satellite would receive data transmitted from ground-based sites and store that data on board. The information then would be relayed to a Globesat-operated central control station in Logan, Utah when the satellite is within line of sight of the ground receiver. According to Dr. Megill, one satellite could serve thousands of those sites each day. Another use of the store-and-forward concept could be tracking trucks or rail cars equipped with small transmitters.

Management and Employment

Globesat is a wholly-owned subsidiary of Globesat Holding Company which acquired two other firms in 1988. Although there is no formal structure between the three companies, there are numerous informal ties. For example, Dr. Rex Megill (the founder) is the president of Globesat Holding Company and Vice President of Engineering for Globesat, Inc. Kent Backman is the current president of Globesat. Mr. Backman has a background in mechanical engineering and was formerly the president of Questronics (one of the recently acquired companies). He has 18 years of managerial experience.

R. Gilbert Moore is Vice President in charge of Advanced Programs. Prior to joining Globesat, Mr. Moore worked for Morton Thiokol Corporation as special projects manager and played an influential role in Project NUSAT (Northern Utah SATellite), a joint effort between Utah State University and Weber State College to build a small satellite that could be deployed from a Get Away Special (GAS) canister.

Globesat, Inc. has 15 employees. Of this total, 10 employees are involved in R&D. Given the complexity of the development and manufacturing of satellites, the research staff consists of individuals with advanced degrees in physics, electrical engineering, and mechanical engineering. Globesat recruits graduates and faculty of Utah State University to fill many of these positions. The company's relationship with Utah State University has been very important. For example, Globesat's proximity to and close working relationship with Utah State University's Center for Space Dynamics Laboratory were important factors in Globesat's selection by NASA to define a spacecraft-based testing platform.

Utah: An Executive Opinion

Globesat was established in Utah because of space research underway at Utah State University. The relationship with the university has played an important part in the company's success. Globesat has been able to draw on the technical talents of USU's faculty. On the other hand, Dr. Megill feels there is a real capital gap in Utah. His company has gone to enormous lengths to find sources of capital. He is of the opinion that venture capital is almost nonexistent in Utah.

Hart Scientific

Background

Hart Scientific was founded in 1979 by Roger Hart and Mike Hurst, while both were employed as engineers at Tronac Engineering in Orem, Utah. According to Dennis Hunter (current President and CEO) the impetus behind the company's formation came from Tronac's president. Both Roger and Mike wanted to expand the company's product line and enter into new ventures. The president was not interested in expanding and the two entrepreneurs left to form their own company. For three years, the founders were the sole employees and they struggled to get the new company off the ground. Finally, realizing that the company stood a slim chance of survival under their management, they began looking for an experienced manager.

In 1984, Dennis Hunter joined the company and assumed all managerial and financial responsibilities. Roger Hart assumed the position of Vice President for Research and Development and Mike Hurst assumed the position of Vice President for Operations. Both founders retained an equity position in the company. Hart Scientific manufactures computerized, scientific instruments—specifically, constant temperature monitoring instruments and temperature-related instruments.

Products

Hart Scientific develops and manufactures a wide range of temperature monitoring instruments. For example, the company has developed a heat

conduction calorimeter instrument which is used in battery testing, corrosion studies, materials-aging analysis, chemical kinetics, microbiology and biochemistry. The heat conduction calorimeter can generate a wide temperature range of -40° to 200° Centigrade and has a temperature accuracy of +/-0.5°C and a temperature stability of +/-0.001 typ. A similar instrument, an isothermal flow calorimeter, achieves a -40° to 200° Centigrade temperature range; however, this instrument measures the heat of mixing, dilution and reaction. It is also used in petroleum processing and liquid extraction/separation of supercritical fluids, biochemical studies analyzing enzymes, and concentrated electrolytes.

The company's most advanced temperature instrument is the ultra stable constant temperature bath and circulation instrument. This instrument produces a temperature range of -80° to +300° Centigrade, with an optimum accuracy and stability of +/-0.0005°C to assure exact temperatures settings at all times. Hart Scientific has built calibration baths for the Air Force, thermal shock baths for instrument testing and computerized baths for data collection and analysis for petroleum companies.

In addition to these instruments, Hart Scientific has developed a number of other precision instruments designed to measure variations in temperature and has the capability to design and build temperature instruments to meet specific testing requirements.

Funding

Hart Scientific is a bootstrap, start-up company. The initial capital came from the founders (Roger Hart and Mike Hurst). Both took second mortgages on their homes to raise $25,000 in seed capital. Soon after, they borrowed $100,000 from a private investor to keep the company running. Even with this capital infusion the company had a severe cash flow problem, and the founders began factoring the company's accounts receivables at about 50 percent on the dollar.

Recognizing that they had a problem, the two founders brought Dennis Hunter into the company in 1984. Mr. Hunter had extensive experience in investment banking and management. His first step was to create a R&D limited partnership with local investors. One local investor Mr. Hunter approached was Questar Development, the holding company for Mountain Fuel Supply. This partnership was a natural. Under the terms of the agreement, Questar would utilize the technical expertise of Hart Scientific. This partnership eventually led to an equity partnership (Questar purchased equity in the company).

Mr. Hunter also approached several local banks to establish a line of credit for the company in order to eliminate the cash flow problem. It was only through his personal connections that he was able to secure a line of credit with a local bank. This banking relationship was terminated when his contact left the bank since nobody else understood the nature of the business. The same situation occurred the next year; and finally, Mr. Hunter was forced to go outside the state to secure a line of credit that was large enough to meet the company's needs. In this instance, the financial organization was a holding company for banks located in the Western United States. The holding company made arrangements with a local bank to provide the necessary credit facility.

Hart has recently formed another partnership with Ford Motor Company to develop an emission instrument, and has entered into agreements with Continental Can, Schlumberge and R. J. Reynolds. Recently, additional research monies have been obtained through the SBIR program. The company was awarded $50,000 to complete a Phase I grant and $560,000 for a Phase II grant.

An Initial Public Offering (IPO) may be in Hart's future. Provided the equity market can facilitate an IPO, Mr. Hunter plans on taking the company public within a year. However, if the market is soft, or IPOs are unpopular with investors, the company will most likely continue its strategy of using R&D partnerships, SBIR grants, and equity partnerships.

Sales

Hart Scientific has experienced a phenomenal rate of growth in sales. In 1983 sales totaled only $300,000; however, in the following year, sales jumped 360 percent to $1.4 million. Between 1984 and 1985, sales posted a 35 percent gain to $1.9 million. In the following year, 1986, sales were flat with only a 5 percent increase to $2 million. Sales grew to $2.5 million in 1987 which represents a 25 percent increase from the previous year. For the four-year period between 1983 and 1987, sales grew at an annual average rate of over 100 percent.

Market Potential

Hart Scientific develops and manufactures very specialized temperature calibration instruments. The company's clients include Fortune 500 companies, government agencies, and universities. Last year, domestic sales accounted for 85 percent of the company's revenues while 15 percent of the revenues were generated in the international market. The company has succeeded by specializing in a very technical niche market. Though the market potential for any one of the company's instruments is very narrow, the market for the company's expertise in this field is strong as long as the company continues to successfully develop new instruments.

Because the company is not dependent on just one product, the risk of losing sales is greatly reduced.

The company is not threatened by a new innovation because a single innovation would not impact all instruments and therefore, sales. Second, the company has very few competitors. Finally, the company is not tied to fluctuations in any specific industry; and since the market niche is narrow, the company's products are expensive and provide excellent gross margins. Hart's strategy is to discover and protect a market niche through superior product development. The company advertises in trade magazines which reach a specific user market.

Following a niche strategy has its drawbacks. Even with comfortable margins, the company has no way to improve its revenues through increased production. The production runs are simply too specialized to capitalize on economies of scale or volume. Consequently, the company must continue to find new market niches.

Management and Employment

For the first three years after forming Hart Scientific, Mike Hurst and Roger Hart were the company's sole employees. They tried to do everything: raise capital for the fledgling firm, develop and market the instruments, and manage the day-to-day affairs of the company. Under these conditions it is not surprising that the firm struggled, especially since the founders had little business experience and almost no experience in finance. When Dennis Hunter joined the company, the founders returned to product development activities. Mr. Hart currently serves as the Vice President of Research and Development and Mr. Hurst is Vice President of Operations.

Hart Scientific employs 35 people, 16 of these people are involved in development activities (1 chemical engineer, 2 mechanical engineers, and 13 electrical engineers). In terms of direct management, Mr. Hart is responsible for the technical force at Hart Scientific, although a few of the technical staff report to Mr. Hurst. Four employees are involved in marketing and they report to Mr. Hunter, as does the administrative staff. There is very little employee turnover at Hart Scientific. Although low turnover is characteristic of a high growth firm, Hart Scientific relies on referrals as a way to select new employees and this may also contribute to the low turnover.

Utah: An Executive Opinion

Hart Scientific is located in Utah because the founders lived in the state and wanted to stay after the company was established. Too often, this simple explanation is overlooked. Even so, Mr. Hunter feels Utah is a favorable place for Hart to be located. According to him, one of Utah's best assets is its labor force. The company has met its labor needs with local people who will work for less than the company would pay if it were located in a more metropolitan area. The "quality of life" found in Utah was another advantage mentioned by the executives at Hart Scientific.

Utah has its disadvantages as well. Mr. Hunter expressed dissatisfaction with the local banking community several times. Although the company has a satisfactory relationship with a local bank at the present time, it took several years and many false starts before a bank could be found that was willing to help. According to the CEO, this situation was not only frustrating, it was almost fatal.

Megahertz Corporation

Background

Megahertz Corporation exemplifies the trials and successes of an emerging high tech firm. Founded in 1985, this Salt Lake City-based computer peripheral company was launched by two co-founders (David Spafford and Keith Thompson) who developed, financed, and marketed a "Turboswitch". From these humble beginnings, Megahertz has increased its sales, revenues, and employment in the past four years. Moreover, the company has expanded its product line to include an array of memory/modem peripherals for laptop personal computers and has gained industry-wide recognition. Despite these successes, Megahertz faces new challenges: increasing competition, a need for new products, and of course, ongoing financial concerns. Spencer Kirk is the company's President and CEO. Keith Thompson is no longer employed at Megahertz.

Products

The turboswitch was the company's first commercial product. This peripheral boosts the response time or speed of a personal computer and was an instant success. Within the first six months, the company sold almost 1,000 turboswitches. At a production cost of just $20 per switch and a retail price of $150, the turboswitch provided healthy margins and profits for the fledgling company. This success encouraged the founders to formalize their operations and incorporate. After launching Megahertz, the founders realized that although the Turboswitch was very successful, competition would eventually erode this market (and the firm's position in that market) unless additional products were developed.

Within 18 months after producing the first switch, Megahertz merged with Vector Development.

This merger accomplished several objectives. First, almost immediately Megahertz was able to expand its product line since Vector had already developed modem technology; second, the company was publicly-traded, so as a result of the merger Megahertz became a traded entity. (It should be noted that the company has since gone private.) Finally, the merger opened a door for Megahertz and it was quick to take advantage of the opportunity. The following year (1987) sales jumped to $3 million, although some of this gain was due to extraordinary circumstances. During the critical two-year period, 1985 to 1987, Megahertz was almost entirely internally-funded. Sales from the Turboswitch and the modems allowed the company to expand.

The company has since developed an array of modems and memory cards for Toshiba, Compaq, Sharp, Sanyo, Zenith, NEC, and Epson. All Megahertz products support industry standard protocols for complete compatibility. These modems support both U.S. and International Standards, as well as the full Hayes "AT" command set. The firm's 3720 emulation cards support both IRMA and IBM applications. The modems are packages with software for "plug-and-play" right out of the box.

Megahertz manufactures a complete line of modems and memory cards for laptop computers. The EasyTalk T1200 and EMS/T1200 are representative of the types of products developed by the company. The EasyTalk EMS/T1200 is a multi-function board which is compatible with a Toshiba laptop. This peripheral provides one megabyte of memory and a 1200/300 baud internal modem, which allows the user to fully utilize the power of integrated software programs like 1-2-3, Symphony, Framework, and Desqview. The EasyTalk T1200 internal board modems for the Toshiba laptop computers allows the user to be in touch with the office, sending and receiving data without a hitch. Other features such as auto-answer and auto-dial make EasyTalk modems a very competitive peripheral.

The Megahertz product line includes eight separate peripherals (modems, connectivity cards, and memory cards) for Toshiba; two modems for Compaq; two modems for Zenith; two modems for NEC; and one modem each for Epson, Sharp, and Sanyo. Prices for these peripherals range between $999 for EMS memory modem cards for Toshiba and $249 for the Zenith 1200 baud modem.

As evidenced by this price structure, Megahertz competes in a very price sensitive industry. In order to maintain a competitive advantage, Megahertz has developed a cost-efficient production system. All the electronic components for the peripherals are brought to the company where they are "kitted". The kits are then sent to manufacturers located in Salt Lake County to be assembled. Megahertz contracts with four manufacturers for this work. After assembly the modems are returned to Megahertz for testing and shipping. This arrangement reduces the company's labor costs and fixed capital investment requirements, which in turn, makes the company more competitive. This is an important reason why the company has succeeded.

Funding

Megahertz was a bootstrap start-up. David Spafford and Keith Thompson provided the initial start-up capital. The company was fortunate that sales from the Turboswitch provided an immediate cash flow in its seed phase. However, even with sales and healthy margins, financing the company was very difficult and required investments by other principals.

Initially, the company's reliance on internal funding created an acute awareness of cash flow and of the need to minimize costs and expenses. For example, all shipments were sent C.O.D. Receivables, especially a large receivable account, can create severe cash problems for a young firm. Megahertz avoids this problem through C.O.D. billing. Megahertz also reduces its fixed capital requirements by contracting with other firms to assemble its products. In addition to reducing labor costs and associated capital costs, this practice allows the firm to invest in equipment which can be used for testing and quality control.

It is not surprising that after several successful years, venture capital investors would notice Megahertz. In fact, the company has been approached by local venture investors. The company's response to this overture was less than enthusiastic. Management feels that the price of venture investments are far too high. The founders and other equity holders did not want to give up a large percentage of the company and perhaps management control as well. After weighing the alternatives, they decided that slower growth funded through cash flow was the best policy for Megahertz.

Market Potential

Megahertz designs and manufactures peripherals for the laptop computer market. According to Mr. Kirk, laptop computers are a rapidly growing segment of the personal computer market and demand for this product is expected to outpace demand for the desktop personal computer. "Portability is preferred" especially when there is no noticeable reduction in capacity. Sales of laptop models account for 17 percent of all computer sales. The market is expanding at an annual rate of 70 percent. Clearly, this level of expansion will taper; however, the laptop segment will continue to expand and with it, the company's market. The challenge for Megahertz is to develop products at a pace that matches market growth without compromising quality. In response to this challenge, the

company has introduced six new peripheral products since June 1988 and has four additional products on the drawing board.

Management and Employment

Spencer Kirk is both President and CEO of Megahertz. Mr. Kirk was educated at the University of Utah, and has an MBA. His contribution to the partnership was a strong background in finance and marketing, although prior to forming Megahertz he had very limited practical business experience. Dave Spafford is the Vice President of Marketing and also holds an equity position in the company.

As a small growing company, the management style at Megahertz is best described as "hands-on". The executives are very familiar with the overall operations of the company as well as each individual specialty. This style encourages interplay between the executives and, more importantly, facilitates a quick response to customer's needs. Management has deliberately kept the structure simple and responsible. This fits their overall business philosophy of minimizing expenses without compromising response time. Megahertz is enjoying tremendous growth. At issue is whether the present executive core can shepherd the company to the next plateau.

Megahertz employs 24 people. Four of these employees have technical backgrounds in electrical engineering and four are employed in the company's newly established in-house telemarketing program. Part-time employees are used as needed. Megahertz has had little problem finding qualified people. Moreover, according to the company's CEO, turnover within the company is very low.

Utah: An Executive Opinion

In recent months, the founders of Megahertz explored the feasibility of relocating to Texas. While they elected to remain in Salt Lake, this exercise reconfirmed to them the disadvantages of operating a business in Utah. According to one of the company's executives, "The differences between city officials and bankers in Austin, Texas and Salt Lake were like night and day." Austin city officials rolled out the red carpet when Megahertz visited the city. The Chamber of Commerce arranged a tour of the city, meetings with real estate brokers and bankers. The Chamber also arranged several meetings between the executives and vendors and founders of high tech companies located in Austin. The visit to Austin and the responsiveness and of city officials left a very positive impact on the founders of Megahertz. But, the company elected to remain in Utah. Why?

There are many reasons: first, the founders are from Salt Lake. They like the state and its culture. Second, the quality of labor in the local market is exceptional. Third, the company has excellent working relationships with its vendors, suppliers and manufacturers. So, while Austin was attractive for many reasons, the founders opted to remain in the state. Nevertheless, this victory for the local economy should not cloud the issues facing the state and start-up companies.

One of these issues involves the banking community. The CEO of Megahertz expressed some very definite opinions concerning Utah banks. He feels that local banks have not helped his company even though the company has shown impressive gains. Megahertz has been unable to secure short term financing and, according to the CEO, local banks either do not understand or are unwilling to address the special needs of a small, start-up company like Megahertz. He went on to say in an interview that other executives agree with his assessments.

For Megahertz, the primary "Utah" issues are shortcomings in the economic environment. The market is not meeting their needs, and perhaps the needs of dozens of similar companies. Unless there is a change, other companies will be looking and moving elsewhere.

TheraTech, Inc.

Background

Founded in 1985, TheraTech, Inc. (TTI) has emerged as one of Utah's fastest growing pharmaceutical companies with the development of controlled-release drug delivery systems. Like many companies located in the University of Utah Research Park, TTI maintains strong ties with the University of Utah. Two of the company's founders are faculty members at the University. Dr. William Higuchi is a Distinguished Professor and Chairman in the Department of Pharmaceutics, and Dr. Sung Wan Kim is a Professor of Pharmaceutics and Adjunct Professor of Bioengineering, and is the Director of the Center for Controlled Chemical Delivery. Both founders serve on the Board of Directors of TTI, as well as serving in their academic positions at the university. Dr. Dinesh Patel is the third founder of the company. He is also President and CEO of the company.

Products

Controlled-release technology has rapidly emerged over the past decade as a new interdisciplinary science

offering significant therapeutic advantages over conventional pharmaceutical dosage forms. The basic concept behind controlled drug delivery lies in the fundamental dose-response properties of each therapeutic agent. As the drug enters the body, it first appears in the circulating blood from which it then distributes to the eventual site(s) of biological action. These end-point pharmacological effects are dependent upon the level of the drug in the circulating blood. At a certain level, the drug produces the desired pharmacological effect, while toxic side effects or no effects are encountered at levels either above or below (respectively) the effective level. The effective drug level in the blood may be constant over time, or may be a complex temporal pattern depending upon the drug—each drug is different.

The level of a drug in the blood represents a dynamic balance between the rate at which the drug is eliminated from the body (by metabolism, excretion, etc.), and the rate at which the drug is delivered into the body. The goal of controlled drug release technology is to provide the effective blood level profile by providing the necessary drug delivery rate profile to the body, optimizing therapeutic efficacy while minimizing deleterious side effects.

TTI is active in virtually all areas of drug delivery research, including drug targeting, drug carrier research, and biodegradable polymer research. However, near term product development activities are focused on transdermal and oral drug delivery. Transdermal drug delivery involves administering therapeutic agents at desired rates through the skin. Due to the inherent barrier properties of skin, few drugs can be delivered transdermally at therapeutically effective rates based on the intrinsic permeabilities of the drugs. TTI has, therefore, developed multicomponent permeation enhancers, agents which increase the permeability properties of drugs through skin. By delivering these drugs transdermally, the effective blood level of the drug can be maintained for extended durations.

Theratech's enhancer technology can be tailored to numerous drugs for transdermal administration. The company has also developed trandsermal system designs specific for these enhancers, providing stable transdermal dosage forms that are applied directly to the skin. There are presently five transdermal products in clinical development at the company. The company is also pursuing new oral delivery systems for drug administration in the gastrointestinal tract.

Funding

TTI was a bootstrap company. The three founders of the company contributed the initial capital. Unlike many start-up companies, TTI had several advantages which helped the company obtain new funding. The most important advantage is the reputation and expertise of the founders. Dr. Higuchi has been active in the development and research of drug delivery systems for over 25 years. During this time, he has acted as a consultant to many major pharmaceutical companies and has published over 250 articles and research papers dealing with drug delivery systems.

Dr. Kim has done pioneering work in the areas of thrombus formation on polymer surfaces and hydrogel drug delivery systems. He has published over 150 articles and research papers on these topics, as well as edited three books on advances in drug delivery systems. While at Alcon Laboratories, Dr. Patel (president and CEO of the company) led a research team that was responsible for the development of new delivery systems and optimizing ocular and topical dosage forms.

It is hardly surprising that major pharmaceutical companies wanted to be involved with this new company headed by such illustrious researchers. Soon after TTI was formally established, the founders entered into research and development agreements to develop transdermal products for a Japanese company and a Korean company. These agreements represented a second round of financing for the firm. With these in place, TTI had sufficient capital for the short run. The third major round of financing was an equity investment made a U.S. pharmaceutical company for 10 percent of TTI.

Because of its success in attracting corporate investors and its ability to contract its research expertise, TTI has avoided many of the capital problems that beset other start-up firms. In fact, as reported by the president of the company, "investment capital is not a problem". The company is considering another 10 percent equity sell to a second pharmaceutical company and is negotiating several research and development partnerships in which TTI would not only develop selected products but also would share in the financial success of these products through royalty streams on the finished product.

TTI has been approached by several venture firms. However, the company is not interested in pursuing such capital at present. Investments made by corporations and a lucrative R&D business ($1.25 million annually) meets the firm's capital needs. Furthermore, the price of venture capital is simply too high.

However, the company will have to investigate other avenues if it wishes to continue its rapid growth. Over the past three years, the company has confined its efforts to the research and development of three or four products. The next phase of growth includes the development of manufacturing and marketing capabilities. Ultimately, TTI hopes to become a fully integrated pharmaceutical company. Such plans require

a substantial capital investment. The firm is considering a public offering as soon as enough products are ready for market. Until that time, TTI will continue to rely on research contracts and equity investments to generate revenue.

Market Potential

In just five years and with the development of only five transdermal drugs, the market for this type of delivery system has exploded to over $500 million. Each time a drug can be administered through this system, the market expands even more. For example, when nitrogyclerine was administered through a tiny pill, the market was around $40 million. After the development of the patch the market for the same drug for the same use, skyrocketed to $200 million. If this example is multiplied by the number of potential drugs which are adaptable to this delivery system, the market potential expands exponentially. According to Dr. Patel, TTI ranks in the top five companies involved in drug delivery systems of this type. Alza, Inc., and CIBA-Geigy, Inc. are major competitors; however, TTI has a competitive advantage because of its proprietary enhancer technology.

Management and Employment

TTI's management structure is very simple. Dr. Patel is the President and CEO. Dr. Higuchi is Chairman of the Board, and Dr. Kim is a member of the Board of Directors. Currently, the financial matters are managed by a comptroller who reports to the president. Dr. Ebert is responsible for the R&D efforts of the company. Dr. Ebert has over six years experience in the development of advanced drug delivery systems. At one time he headed the systems development group at CIBA-Geigy, one of TTI's chief competitors.

When the firm began in 1985, the only full-time employee was Dr. Patel. Presently, TTI employs 30 professionals and staff personnel. Another three researchers will join the firm within the year. The company has not had difficulty filling entry-level research or staff positions. One reason may be that TTI offers very competitive salaries. As Dr. Patel explained, TTI must offer salaries that can attract preeminent researchers. While these salaries are higher than those offered by other companies in Utah, it is worth the additional dollars to get the right people. The company does use University of Utah graduate students as research assistants. Dr. Patel reports that the company has very low employee turnover. He attributes this to the type of research being conducted at the company and the firm's hiring practices.

Utah: An Executive Opinion

TTI intends to become a major, fully-integrated pharmaceutical company. One of the questions asked by management is whether or not Utah is the ideal location for such ambitious plans. The verdict is still out. Although it is difficult to persuade experienced pharmaceutical researchers to relocate in Utah, TheraTech has been successful in recruiting top-flight researchers. As the company grows, its need for experienced researchers will be much greater than it is at present. Management is concerned that recruitment may be a bottleneck in its development.

As TTI has not had to use venture capital, Dr. Patel, unlike other presidents of emerging companies, has had minimal interaction with the venture capital community. To date, the president has been satisfied with the services provided by local banks. Undoubtedly, these issues will be more pressing when the company launches its expansion.

Nevertheless, for the founders the advantages of Utah far outweigh the recruitment problems. The president readily acknowledges that without the University of Utah, TTI would not have grown at such a rapid pace. The company's founders are still faculty members at the University. Moreover, the company's proximity to the campus, the availability of graduate students and new researchers, and technical resources, have all contributed to the firm's success. For these reasons, as well as the founders' preference to remain in Utah, TTI will likely stay, at least for the short term.

ADDENDUM

The following addendum is included to clarify the early history of Novell, Inc. as reported in the *Utah Economic and Business Review*, Vol. 49, Number 2 (February 1989). This additional history and information has been provided by Jack Davis who currently serves as Vice President of Corporate Development at Icon International, Inc. located in Orem, Utah. Mr. Davis is one of Icon's founders.

The roots of Novell, Inc. can be traced back to 1979 when Jack Davis (one of the original founders) first heard about the newly developed Motorola 68000 microprocessor chip. As information about this product became more readily available, Davis began considering the possibility of developing a computer system that could take advantage of powerful capabilities of the 68000 microprocessor chip. By the middle of 1979, Davis had put together a business plan for his new venture, and contacted a former acquaintance, George Canova, asking him to review and critique the plan.

Davis and Canova knew each other from their days together at Century Data. Century Data was a company founded by George Canova and acquired by Cal Comp, a company for which Davis worked. Davis and Canova worked together for about a year after the acquisition before Davis left and went to work for General Automation. As Canova was the founder of a successful high tech company, Davis felt Canova's insights would be valuable in developing a business plan that was attractive to venture investors. Rather than critique the business plan, Canova was so impressed with the product concept that he agreed to invest $250,000 in the new company with the understanding that he would secure all additional financing. This was agreeable to Davis, and Novell Data Systems, Inc. (NDSI) was formed in August 1980.

Canova made an initial investment of $100,000 in NDSI and became President of the company. Davis was the Executive Vice President responsible for marketing, terminal development, and new product planning. Although Canova had agreed to secure follow-on financing for NDSI, he was unable to do so. After several unfruitful attempts, Canova informed Davis that he was unwilling to invest any more of his money into the venture unless new financing was secured. At this point Davis called on a former client, Victor Virpole, who was working for a company called Safeguard Business Systems (later it became Safeguard Scientifics, Inc.). Virpole convinced his boss, Pete Muesser, that the concept was a sound one that would be worth pursuing. Soon after, Davis and Canova flew to Philadelphia and made their presentation. That day, Safeguard agreed to provide $1.8 million in venture capital and wrote Davis a check for $180,000, Canova put in another $100,000 and the company was off and running.

The original product concept, as described in NDSI's business plan, was the development of a high-speed, multiprocessor, multiuser computer system that used the Motorola 68000 chip. This was to be the company's primary product. SuperSet, a software development consulting group, was hired to develop a word processor for the system. In addition to the 68000 computer system, the company was also developing another product known as a Universal Terminal that Davis had brought with him from Terminal Specialties, a company of which he founded and worked for prior to the formation of NDSI.

Internal problems at NDSI began when Davis and Canova were unable to reconcile their differences as to the focus of the company's development efforts. Canova wanted to develop and market a product quickly in order to generate enough money to offset development costs. Davis wanted to continue development of the computer system. However, Canova was President, so despite Davis' objections, he elected to take the Universal Terminal, make minor modifications and turn it into a personal computer system. Unfortunately, this new system turned out to be another "me too" computer system that did not perform as well as other products on the market. Not only was it an expensive product, it was extremely slow. As a possible solution to the problem, Davis and Canova decided to network the system. SuperSet's efforts were then redirected from writing a word processing program to the development of a networking system. By this time, all development on the 68000 computer system had come to a halt; however, the development work that had been completed was soon put to use.

In designing the network, SuperSet tried to use the terminal computer as a disk server but found it was not powerful enough to do the job. To overcome this problem, they took the one completed board of the 68000 computer system and used it for a server. (That product, with only minor changes in its implementation became the server that Novell sold for a long time as the 68B.)

As development progressed on the personal computer system, tensions between Davis and Canova grew to the point that Canova asked Davis to leave the company. Safeguard was unwilling to intercede, and stood behind Canova's decision. Three months later, Safeguard fired Canova as well. For the next year, Safeguard tried to sell the company. Several offers were made, but each one failed. Finally, Davis, hoping to save what was left of his investment in Novell, contacted Safeguard and asked them to talk with Raymond Noorda. Davis and Noorda had worked together at General Automation prior to the time that Davis founded Terminal Specialties. Noorda had a long history of taking sick companies and making them successful. In desperation, Safeguard contacted Noorda, and in 1983, he agreed to take over as President and co-founder of Novell, Inc.

Utah Business Statistics

UTAH DATA	Feb. 1988	Feb. 1989	% Change from Year Ago	12-Month Average This Year	12-Month Average Last Year	12-Month Average % Change
Total Personal Income (seasonally adjusted) (mil. of dol.) (qtly.)	19,535	NA	NA	NA	19,202	NA
New Corporations (no.)	516	338	-34.5%	452	470	-3.9%
New Car, Truck and Motor Home Sales (no.)	5,572	4,339	-22.1%	5,110	5,027	1.7%
Agriculture						
Average Prices Recorded by Farmers (dol.)						
Beef Steers and Heifers (cwt) (thous.)	66.90	74.00	10.6%	69.42	64.57	7.5%
Lambs (cwt)	77.80	60.20	-22.6%	60.76	73.68	-17.5%
Milk Wholesale (cwt)	11.80	12.30	4.2%	11.74	11.86	-1.0%
Alfalfa Hay, Baled (per ton)	74.00	86.00	16.2%	77.42	68.58	12.9%
Cattle Slaughtered (live weight) (thous. of lbs.)	45,368	44,779	-1.3%	46,666	42,944	8.7%
Construction						
Total Construction (thous. of dol.) 1	111,567	64,728	-42.0%	114,011	119,625	-4.7%
Residential	28,619	24,775	-13.4%	46,454	47,511	-2.2%
Nonresidential	44,614	32,509	-27.1%	38,553	41,537	-7.2%
Public Works and Utilities	38,334	7,444	-80.6%	29,039	30,575	-5.0%
Total Permit Construction (thous. of dol.) 2	55,560.0	51,264.3	-7.8%	71,389.7	86,574.4	-17.5%
Residential	27,284.0	20,802.6	-23.8%	34,118.8	40,055.0	-14.8%
Nonresidential	16,996.5	24,375.7	43.4%	23,980.9	32,881.1	-27.1%
Additions, Alterations, and Repairs	11,309.5	6,086.0	-46.2%	13,290.0	13,638.3	-2.6%
New Dwelling Units (no.)	406	283	-30.3%	466	586	-20.4%
Employment						
Civilian Labor Force (thous.)	743.7	765.3	2.9%	760.2	755.0	0.7%
Total Employed Persons	698.2	729.3	4.5%	725.0	709.6	2.2%
Unemployed Persons	45.5	36.0	-20.9%	35.2	45.4	-22.4%
Percent Total Labor Force	6.1	4.7	-23.0%	4.6	6.0	-23.0%
Employees on Nonagricultural Payrolls (thous. of jobs)	639.9	665.4	4.0%	661.0	642.4	2.9%
Manufacturing	94.9	101.0	6.4%	98.5	93.5	5.3%
Mining	8.3	7.6	-8.4%	8.2	8.1	0.8%
Contract Construction	20.5	20.6	0.5%	24.5	26.1	-6.1%
Transportation, Communication, and Utilities	37.8	39.8	5.3%	39.6	38.0	4.2%
Wholesale Trade	34.5	35.8	3.8%	35.0	34.8	0.5%
Retail Trade	115.3	120.3	4.3%	120.7	118.0	2.3%
Finance, Insurance, and Real Estate	33.5	32.9	-1.8%	33.4	33.7	-1.0%
Services 3	151.3	161.2	6.5%	158.5	148.3	6.9%
Federal Government	39.1	39.3	0.5%	39.5	39.7	-0.6%
State Government 4	39.5	40.2	1.8%	38.3	38.0	0.7%
Local Government 4	65.3	66.7	2.1%	65.0	64.0	1.6%
Average Weekly Hours						
Manufacturing	39.9	39.5	-1.0%	40.6	39.9	1.7%
Mining	43.0	40.9	-4.9%	41.6	41.6	0.0%
Wholesale Trade	38.7	34.9	-9.8%	37.0	38.1	-3.1%
Retail Trade	27.6	26.2	-5.1%	27.9	28.2	-0.9%
Amount of Unemployment Compensation (thous. of dol.)	8,993.5	7,474.6	-16.9%	5,677.9	7,253.1	-21.7%
Finance						
Savings, Savings and Loan Association (mil. of dol.)	2,088.9	2,243.1	7.4%	2,363.5	2,411.2	-2.0%
Tax Collections by the State of Utah (thous. of dol.)						
Total Tax Collections	275,699.4	248,733.9	-9.8%	149,315.0	143,385.2	4.1%
Sales and Use Tax	137,158.9	129,837.1	-5.3%	54,614.9	48,776.7	12.0%
Motor Fuel Tax	9,983.1	9,947.8	-0.4%	10,948.1	9,834.5	11.3%
Individual Income Tax	74,745.1	65,792.2	-12.0%	54,004.1	50,046.8	7.9%
Corporation Franchise Tax	1,175.8	(491.0)	-141.8%	6,507.5	7,250.2	-10.2%
Production						
Net Electric Power Utilized (mil. of kwh)	1,114.7	NA	NA	NA	1,157.6	NA
Crude Oil to Refineries (thous. of bbls.)	3,484.7	3,900.6	11.9%	4,347.3	3,785.6	14.8%
Crude Oil (thous. of bbls.)	2,745.0	2,246.5	-18.2%	2,680.4	2,921.8	-8.3%
Natural Gas (mil. of cu. ft.)	23,646.5	22,506.3	-4.8%	23,017.1	22,114.6	4.1%
Coal (thous. short tons)	1,649.0	1,356.0	-17.8%	1,472.7	1,394.7	5.6%
Tourism/Travel						
Air Passengers (total no. on and off) (S.L. Int'l Airport)	802,631	870,317	8.4%	881,441	849,691	3.7%
Highway Traffic Count Across State Lines	NA	29,321	NA	NA	NA	NA
Transient Room Taxes (thous. of dol.)	(175.6)	1,225.7	-798.0%	644.0	362.9	77.5%
Visits, State, Nat'l. Parks, Monuments (thous.)	345.4	263.9	-23.6%	1,093.5	1,066.0	2.6%
Utilities						
Telephone Lines in Service (Mt. Bell)(Residential)	486,615	497,063	2.1%	490,260	481,313	1.9%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	178,484	184,235	3.2%	181,962	176,696	3.0%
Electric Customers (Residential)	477,257	483,845	1.4%	477,755	474,058	0.8%
Electric Customers (Commercial)	46,468	48,006	3.3%	47,057	46,343	1.5%
Natural Gas Customers (Residential & Commercial)	462,050	472,690	2.3%	461,027	448,734	2.7%
Natural Gas Customers (Industrial)	543	554	2.0%	551	552	-0.2%

Utah Business Statistics

UTAH DATA	Feb. 1988	Feb. 1989	% Change from Year Ago	12-Month Average This Year	12-Month Average Last Year	12-Month Average % Change
Davis County						
Non-Ag. Employment (thous.)	50.1r	52.0f	3.8%	52.7	52.0	1.4%
Unemployment Rate	5.4r	3.3	-38.9%	4.0	5.3	-23.8%
Auth. Permit Construction (thous. of dol.)	7,029.2	4,510.3	-35.8%	8,996.9	12,453.7	-27.8%
New Dwelling Units (no.)	55	34	-38.2%	67	87	-23.3%
Postal Receipts (thous. of dol.)	401.7	645.6	60.7%	458.8	385.8	18.9%
Electric Customers (Residential)	48,142	47,816	-0.7%	48,171	47,530	1.3%
Electric Customers (Commercial)	3,362	3,574	6.3%	3,500	3,309	5.8%
Natural Gas Customers (Residential)	50,372	51,808	2.9%	50,643	49,087	3.2%
Natural Gas Customers (Industrial)	53	54	1.9%	53	52	1.9%
Telephone Lines in Service (Mt. Bell)(Residential)	54,849	56,209	2.5%	55,570	54,860	1.3%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	10,990	11,742	6.8%	11,459	10,680	7.3%
Salt Lake County						
Non-Ag. Employment (thous.)	331.2r	343.1f	3.6%	341.5	333.7	2.4%
Unemployment Rate	5.5r	3.7	-32.7%	4.2	5.5	-22.6%
Auth. Permit Construction (thous. of dol.)	21,767.3	31,805.0	46.1%	31,371.4	39,221.7	-20.0%
New Dwelling Units (no.)	140	130	-7.1%	179	219	-18.4%
Postal Receipts (thous. of dol.)	7,525.4	8,690.3	15.5%	8,151.8	7,350.0	10.9%
Electric Customers (Residential)	240,036	244,072	1.7%	240,361	236,948	1.4%
Electric Customers (Commercial)	20,234	21,020	3.9%	20,516	20,026	2.4%
Natural Gas Customers (Residential)	223,119	225,883	1.2%	221,345	217,761	1.6%
Natural Gas Customers (Industrial)	231	236	2.2%	237	238	-0.1%
Telephone Lines in Service (Mt. Bell)(Residential)	229,184	233,418	1.8%	230,953	227,453	1.5%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	110,053	111,864	1.6%	111,305	110,018	1.2%
Utah County						
Non-Ag. Employment (thous.)	77.7r	83.0f	6.8%	78.4	75.3	4.1%
Unemployment Rate	5.7r	3.0	-47.4%	3.9	6.4	-38.9%
Auth. Permit Construction (thous. of dol.)	12,070.6	5,681.1	-52.9%	10,709.6	12,492.0	-14.3%
New Dwelling Units (no.)	88	52	-40.9%	64	93	-30.6%
Postal Receipts (thous. of dol.)	1,082.8	1,369.2	26.4%	1,249.5	942.7	32.5%
Electric Customers (Residential)	51,740	52,699	1.9%	52,486	52,291	0.4%
Electric Customers (Commercial)	5,907	5,950	0.7%	5,984	6,207	-3.6%
Natural Gas Customers (Residential)	62,176	63,263	1.7%	61,962	60,500	2.4%
Natural Gas Customers (Industrial)	70	74	5.7%	69	69	0.7%
Telephone Lines in Service (Mt. Bell)(Residential)	64,672	66,447	2.7%	64,971	62,751	3.5%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	19,766	21,185	7.2%	20,391	19,021	7.2%
Weber County						
Non-Ag. Employment (thous.)	60.4r	62.9f	4.1%	61.8	60.4	2.3%
Unemployment Rate	6.8r	4.4	-35.3%	5.2	7.1	-26.4%
Auth. Permit Construction (thous. of dol.)	4,649.3	1,860.7	-60.0%	5,276.8	7,776.3	-32.1%
New Dwelling Units (no.)	42	14	-66.7%	44	65	-31.7%
Postal Receipts (thous. of dol.)	684.0	664.2	-2.9%	680.3	620.4	9.7%
Electric Customers (Residential)	53,547	54,419	1.6%	53,641	52,976	1.3%
Electric Customers (Commercial)	4,896	4,980	1.7%	4,939	4,867	1.5%
Natural Gas Customers (Residential)	50,230	50,922	1.4%	49,936	49,104	1.7%
Natural Gas Customers (Industrial)	83	80	-3.6%	83	85	-2.3%
Telephone Lines in Service (Mt. Bell)(Residential)	46,112	47,049	2.0%	46,643	46,017	1.4%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	11,341	12,093	6.6%	12,005	11,144	7.7%

1 Obtained from F.W. Dodge Statistics.
2 Obtained from *Utah Construction Report*.
3 Includes services by nonprofit and religious organizations.
4 Includes public schools and college institutions.

NA Not Available
r Revised
f Forecast

Sources:

Personal Income	U.S. Department of Commerce, Bureau of Economic Analysis.
New Corporations	Utah Secretary of State.
New Car and Truck Sales	Utah State Tax Commission, Economic and Statistical Unit.
Agriculture	U.S. Department of Agriculture, Utah Agricultural Statistics Service, *Utah Agriculture*
Construction Data	F.W. Dodge Statistics and Bureau of Economic and Business Research, *Utah Construction Report*
Employment Data	Utah Department of Employment Security.
Savings Information	Utah Savings and Loan Institutions.
Tax Collections	Utah State Tax Commission.
Net Electric Power Utilized	Cooperating Utah Power Companies.
Crude Oil Production	Area Oil Refineries.
Natural Gas Production	Utah Department of Oil, Gas, and Mining.
Coal Production	U.S. Department of Energy.
Air Passengers	Salt Lake City International Airport, Statistics Division.
Highway Traffic Count	Utah Department of Transportation.
Visits to State and National Parks and Monuments	U.S. Forest Service, Utah State Parks and Recreation Department.
Utilities Data	Cooperating Utah Utility Companies.
Postal Receipts	Postmasters in Davis, Salt Lake, Utah and Weber Counties.

Utah Business Statistics

UTAH DATA	Mar. 1988	Mar. 1989	% Change from Year Ago	12 Month Average This Year	12 Month Average Last Year	12 Month Average % Change
Total Personal Income (seasonally adjusted) (mil. of dol.) (qtly.)	19,535	NA	NA	NA	19,289	NA
New Corporations (no.)	547	528	-3.5%	450	473	-4.7%
New Car, Truck, and Motor Home Sales (no.)	5,326	5,290	-0.7%	5,107	5,204	-1.9%
Agriculture						
Average Prices Recorded by Farmers (dol.)						
Beef Steers and Heifers (cwt) (thous.)	68.70	74.40	8.3%	69.89	65.13	7.3%
Lambs (cwt)	64.30	64.70	0.6%	60.79	72.78	-16.5%
Milk Wholesale (cwt)	11.50	11.80	2.6%	11.77	11.82	-0.4%
Alfalfa Hay, Baled (per ton)	75.00	87.00	16.0%	78.42	69.33	13.1%
Cattle Slaughtered (live weight) (thous. of lbs.)	48,334	51,829	7.2%	46,957	43,681	7.5%
Construction						
Total Construction (thous. of dol.) 1	98,916	145,820	47.4%	117,356	118,458	-0.9%
Residential	45,652	55,859	22.4%	46,651	46,735	-0.2%
Nonresidential	41,809	59,149	41.5%	40,089	42,658	-6.0%
Public Works and Utilities	11,455	30,812	169.0%	30,652	29,065	5.5%
Total Permit Construction (thous. of dol.) 2	75,864.9	99,218.4	30.8%	73,335.9	82,214.5	-10.8%
Residential	38,080.0	39,580.1	3.9%	34,243.8	38,797.9	-11.7%
Nonresidential	26,343.0	41,781.5	58.6%	25,267.5	29,777.7	-15.1%
Additions, Alterations, and Repairs	11,441.9	17,856.8	56.1%	13,824.6	13,639.0	1.4%
New Dwelling Units (no.)	506	549	8.5%	470	558	-15.7%
Employment						
Civilian Labor Force (thous.)	745.2	765.1	2.7%	760.6	754.3	0.8%
Total Employed Persons	701.5	728.1	3.8%	726.0	709.9	2.3%
Unemployed Persons	43.7	37.0	-15.3%	34.6	44.4	-22.0%
Percent Total Labor Force	5.9	4.8	-18.6%	4.6	5.9	-22.7%
Employees on Nonagricultural Payrolls (thous. of jobs)	646.4	671.4	3.9%	663.3	643.6	3.1%
Manufacturing	95.3	100.3	5.2%	98.9	93.9	5.3%
Mining	8.3	7.6	-8.4%	8.1	8.2	-0.7%
Contract Construction	21.4	21.7	1.4%	24.5	25.8	-4.8%
Transportation, Communication, and Utilities	38.1	39.3	3.1%	39.7	38.0	4.3%
Wholesale Trade	34.8	37.0	6.3%	35.2	34.8	1.2%
Retail Trade	117.0	121.4	3.8%	121.2	118.1	2.6%
Finance, Insurance, and Real Estate	33.5	33.2	-0.9%	33.4	33.7	-1.0%
Services 3	153.4	163.4	6.5%	159.4	149.1	6.9%
Federal Government	39.3	39.9	1.5%	39.5	39.6	-0.3%
State Government 4	39.1	40.1	2.6%	38.4	38.0	1.1%
Local Government 4	66.2	67.5	2.0%	65.1	64.1	1.7%
Average Weekly Hours						
Manufacturing	39.7	39.3	-1.0%	40.5	39.9	1.4%
Mining	43.6	40.0	-8.3%	41.3	41.9	-1.3%
Wholesale Trade	38.5	36.4	-5.5%	36.8	36.2	1.8%
Retail Trade	27.8	26.6	-4.3%	27.8	28.1	-1.2%
Amount of Unemployment Compensation (thous. of dol.)	9,609.8	7,376.5	-23.2%	5,492.1	7,027.1	-21.8%
Finance						
Savings, Savings and Loan Association (mil. of dol.)	2,107.4	2,227.8	5.7%	2,373.5	2,381.7	-0.3%
Tax Collections by the State of Utah (thous. of dol.)						
Total Tax Collections	70,014.8	54,763.9	-21.8%	148,044.1	144,183.2	2.7%
Sales and Use Tax	7,481.1	2,323.9	-68.9%	54,185.1	49,150.4	10.2%
Motor Fuel Tax	10,566.4	10,238.3	-3.1%	10,920.7	10,107.7	8.0%
Individual Income Tax	32,681.3	14,442.9	-55.8%	52,484.2	51,021.1	2.9%
Corporation Franchise Tax	1,493.7	7,049.2	371.9%	6,970.5	6,955.5	0.2%
Production						
Net Electric Power Utilized (mil. of kwh)	1,232.9	NA	NA	NA	1,166.0	NA
Crude Oil to Refineries (thous. of bbls.)	3,599.0	3,829.5	6.4%	4,366.5	3,786.3	15.3%
Crude Oil (thous. of bbls.)	2,864.1	2,469.4	-13.8%	2,647.5	2,923.5	-9.4%
Natural Gas (mil. of cu. ft.)	22,661.5	23,314.4	2.9%	23,071.5	22,379.7	3.1%
Coal (thous. short tons)	1,716.0	1,671.0	-2.6%	1,468.9	1,461.8	0.5%
Tourism/Travel						
Air Passengers (total no. on and off)(S.L. Int'l Airport)	964,406	1,076,602	11.6%	890,791	848,112	5.0%
Highway Traffic Count Across State Lines	NA	36,322	NA	NA	NA	NA
Transient Room Taxes (thous. of dol.)	2,090.2	(34.7)	-101.7%	466.9	574.5	-18.7%
Visits, State, Nat'l. Parks, Monuments (thous.)	485.7	607.5	25.1%	1,103.6	1,072.1	2.9%
Utilities						
Telephone Lines in Service (Mt. Bell)(Residential)	486,879	497,699	2.2%	491,161	481,991	1.9%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	179,376	184,692	3.0%	182,405	177,128	3.0%
Electric Customers (Residential)	476,830	484,142	1.5%	478,365	474,450	0.8%
Electric Customers (Commercial)	46,598	48,023	3.1%	47,176	46,367	1.7%
Natural Gas Customers (Residential & Commercial)	461,877	474,693	2.8%	462,095	449,686	2.8%
Natural Gas Customers (Industrial)	543	559	2.9%	553	551	0.2%

Utah Business Statistics

UTAH DATA	Mar. 1988	Mar. 1989	% Change from Year Ago	12-Month Average This Year	12-Month Average Last Year	12-Month Average % Change
Davis County						
Non-Ag. Employment (thous.)	51.0r	52.5f	2.9%	52.9	51.9	1.7%
Unemployment Rate	5.1r	3.8	-25.5%	4.0	5.2	-24.6%
Auth. Permit Construction (thous. of dol.)	9,562.1	8,239.5	-13.8%	8,886.7	10,00?. 2	-11.2%
New Dwelling Units (no.)	78	72	-7.7%	66	84	-21.3%
Postal Receipts (thous. of dol.)	384.6	574.2	49.3%	474.6	385.5	23.1%
Electric Customers (Residential)	48,050	49,201	2.4%	48,267	47,609	1.4%
Electric Customers (Commercial)	3,384	3,599	6.4%	3,518	3,320	6.0%
Natural Gas Customers (Residential)	50,312	52,029	3.4%	50,786	49,202	3.2%
Natural Gas Customers (Industrial)	52	55	5.8%	53	52	2.4%
Telephone Lines in Service (Mt. Bell)(Residential)	54,929	56,414	2.7%	55,694	54,895	1.5%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	11,156	11,754	5.4%	11,509	10,740	7.2%
Salt Lake County						
Non-Ag. Employment (thous.)	334.6r	345.9f	3.4%	342.5	334.1	2.5%
Unemployment Rate	5.5r	3.8	-30.9%	4.1	5.4	-24.2%
Auth. Permit Construction (thous. of dol.)	32,031.2	50,944.9	59.0%	32,947.5	37,195.8	-11.4%
New Dwelling Units (no.)	195	224	14.9%	181	205	-11.5%
Postal Receipts (thous. of dol.)	7,095.7	8,351.1	17.7%	8,256.4	7,360.3	12.2%
Electric Customers (Residenual)	240,138	243,498	1.4%	240,641	237,211	1.4%
Electric Customers (Commercial)	20,406	20,947	2.7%	20,561	20,069	2.5%
Natural Gas Customers (Residential)	223,141	226,642	1.6%	221,637	217,994	1.7%
Natural Gas Customers (Industrial)	233	237	1.7%	238	237	0.5%
Telephone Lines in Service (Mt. Bell)(Residential)	229,256	233,629	1.9%	231,317	227,731	1.6%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	110,285	112,158	1.7%	111,461	110,121	1.2%
Utah County						
Non-Ag. Employment (thous.)	78.9r	84.2f	6.7%	79.2	75.8	4.5%
Unemployment Rate	5.2r	3.4	-34.6%	3.8	6.2	-38.7%
Auth. Permit Construction (thous. of dol.)	12,914.9	17,400.5	34.7%	11,083.4	12,646.8	-12.4%
New Dwelling Units (no.)	62	97	56.5%	67	86	-21.7%
Postal Receipts (thous. of dol.)	1,026.8	1,415.2	37.8%	1,281.9	952.1	34.6%
Electric Customers (Residential)	51,815	52,670	1.7%	52,557	52,436	0.2%
Electric Customers (Commercial)	5,924	6,076	2.6%	5,997	6,167	-2.8%
Natural Gas Customers (Residential)	62,017	63,245	2.0%	62,064	60,615	2.4%
Natural Gas Customers (Industrial)	69	74	7.2%	69	69	1.1%
Telephone Lines in Service (Mt. Bell)(Residential)	64,690	66,507	2.8%	65,123	62,945	3.5%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	19,718	21,183	7.4%	20,513	19,123	7.3%
Weber County						
Non-Ag. Employment (thous.)	61.0r	63.6f	4.3%	62.0	60.4	2.5%
Unemployment Rate	6.4r	4.8	-25.0%	5.1	7.0	-27.8%
Auth. Permit Construction (thous. of dol.)	8,235.1	5,081.2	-38.3%	5,014.0	7,764.9	-35.4%
New Dwelling Units (no.)	58	46	-20.7%	43	63	-31.4%
Postal Receipts (thous. of dol.)	593.1	654.0	10.3%	685.4	613.5	11.7%
Electric Customers (Residential)	53,514	54,422	1.7%	53,716	53,034	1.3%
Electric Customers (Commercial)	4,931	5,092	3.3%	4,952	4,875	1.6%
Natural Gas Customers (Residential)	50,083	51,173	2.2%	50,027	49,157	1.8%
Natural Gas Customers (industrial)	83	83	0.0%	;83	85	-2.2%
Telephone Lines in Service (Mt. Bell)(Residential)	46,209	47,150	2.0%	46,721	46,044	1.5%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	11,714	12,140	3.6%	12,040	11,209	7.4%

1 Obtained from F.W. Dodge Statistics.
2 Obtained from *Utah Construction Report*.
3 Includes services by nonprofit and religious organizations.
4 Includes public schools and college institutions.

NA Not Available
r Revised
f Forecast

Sources:

Personal Income	U.S. Department of Commerce, Bureau of Economic Analysis.
New Corporations	Utah Secretary of State.
New Car and Truck Sales	Utah State Tax Commission, Economic and Statistical Unit.
Agriculture	U.S. Department of Agriculture, Utah Agricultural Statistics Service, *Utah Agriculture*.
Construction Data	F.W. Dodge Statistics and Bureau of Economic and Business Research, *Utah Construction Report*.
Employment Data	Utah Department of Employment Security.
Savings Information	Utah Savings and Loan Institutions.
Tax Collections	Utah State Tax Commission.
Net Electric Power Utilized	Cooperating Utah Power Companies.
Crude Oil Production	Area Oil Refineries.
Natural Gas Production	Utah Department of Oil, Gas, and Mining.
Coal Production	U.S. Department of Energy.
Air Passengers	Salt Lake City International Airport, Statistics Division.
Highway Traffic Count	Utah Department of Transportation.
Visits to State and National Parks and Monuments	U.S. Forest Service, Utah State Parks and Recreation Department.
Utilities Data	Cooperating Utah Utility Companies.
Postal Receipts	Postmasters in Davis, Salt Lake, Utah, and Weber Counties.

Bureau of Economic and
Business Research
University of Utah
Salt Lake City, Utah 84112
Return Postage Guaranteed
(Non-Profit Organization)

Non-Profit Org.
U.S. Postage Paid

Permit No. 1529
Salt Lake City, Utah

NATIONAL DATA	Mar. 1988	Mar. 1989	% Change from Year Ago	12-Month Average This Year	12-Month Average Last Year	12-Month Average % Change
U.S. Gross National Product (seasonally adjusted) (bil.) (qtly.)	4,724.5	5,116.8	8.3%	4,962.3	4,609.9	7.6%
Total Personal Income (seasonally adjusted) (bil. of dol.)	3,985.9	4,349.7	9.1%	4,152.3	3,848.9	7.9%
Industrial Production Indexes (seasonally adjusted) (1977=100)	134.7	141.0	4.7%	138.8	131.7	5.4%
Total Non-Farm Bus. Expend. on New Plants & Equip. (bil.) (qtly.)	412.0	465.5	13.0%	443.0	397.4	11.5%
Index of Leading Indicators (1982=100)	140.8	144.4	2.6%	143.8	140.3	2.5%
Price Indexes						
Consumer Price Indexes (not seasonally adjusted) (1982-84=100):						
CPI-U (All Urban Consumers) All Items	116.5	122.3	5.0%	119.7	114.7	4.3%
CPI-U (All Urban Consumers) Food & Beverages	116.0	123.3	6.3%	119.9	114.4	4.8%
CPI-U (All Urban Consumers) Housing	117.0	121.5	3.8%	119.5	115.3	3.7%
CPI-U (All Urban Consumers) Transportation	106.5	111.9	5.1%	109.9	106.4	3.3%
CPI-U (All Urban Consumers) Medical Care	136.3	146.1	7.2%	141.1	132.2	6.7%
CPI-U (All Urban Consumers) Energy	86.5	89.8	3.8%	89.9	89.1	0.9%
Producer Price Index (not seasonally adjusted) (1982=100):						
Producer Price Index, All Finished Goods	106.2	112.2	5.6%	109.3	105.9	3.3%
GNP Price Deflator (1982=100) (qtly.)	119.4	125.2	4.9%	123.2	118.5	4.0%
Civilian Employment (seasonally adjusted)						
Total Civilian Labor Force (mil.)	120.9	123.3	2.0%	122.2	120.3	1.6%
Total Civilian Employment (mil.)	114.1	117.1	2.6%	115.7	113.1	2.2%
Unemployment Rate	5.6	5.0	-10.7%	5.4	6.0	-9.8%
Construction						
Total Construction (mil. of dol.)	22,257.3	21,079.6	5.3%	20,296.9	21,375.4	-5.0%
Residential	11,030.6	10,118.1	8.3%	9,790.0	9,933.2	-1.4%
Nonresidential	7,332.7	6,600.2	-10.0%	6,885.3	7,573.3	-9.1%
Non-Building	3,894.0	4,361.3	12.0%	3,621.6	3,891.5	-6.9%
New Dwelling Units (no.)	135,745	115,923	-14.6%	116,075	127,348	-8.9%
Interest Rates						
Short Term (3-month Treasury bill rate)	5.69	8.83	55.2%	7.37	5.88	25.2%
Long Term (30-year Treasury bond yields)	8.61	9.33	8.4%	9.12	8.88	2.7%
Prime Rates Charged by Banks on Short-term Business Loans (avg.)	8.50	11.50	35.3%	9.91	8.48	17.0%
Mortgage Rates (new homes)	8.77	9.63	9.8%	8.98	8.90	0.9%

Sources: *Business Conditions Digest*, U.S. Department of Commerce: U.S. Gross National Product, Total National Personal Income, Industrial Production Indexes, Total Business Expenditures for New Plant Equipment, Index of Leading Indicators, GNP Price Deflator, National Employment Data, Interest Rates.

F.W. Dodge Report, McGraw-Hill: National Construction Data.

Survey of Current Business, U.S. Department of Commerce: New Home Mortgage Rates.

Utah Labor Market Report, Utah Department of Employment Security: Consumer Price Indexes, Producer Price Index.

Chase N. Peterson, *President, University of Utah*
John Seybolt, *Dean, Graduate School of Business*

BUREAU OF ECONOMIC AND BUSINESS RESEARCH

R. Thayne Robson, Director
Frank C. Hachman, Associate Director

BEBR
graduate school
of business
bureau of economic and
business research
university of utah

STAFF OF THE BUREAU OF ECONOMIC AND BUSINESS RESEARCH

Office Staff

Mari Lou Wood, Office Manager
Cathy Crawford, Administrative Assistant
Diane Gillam, Associate Accountant
Lee Carberry, Administrative Secretary
Gaylene Roethel, Administrative Secretary
Michael Khuu, Clerk

Senior Research Economist

Boyd L. Fjeldsted

Publication Staff

James B. Peters, Graphics

Research Analysts, Research Assistants and Programmers

Terry Brewer
Jan Crispin-Little
Alex Englebrecht
Cindy Lewis
Gary Ricks
Austin Sargent
James Wood